

## Appendix A

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## Appendix A

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CGAATTTTAGGTTTCTGTTTTGTTTTCTGTCTCGCGGGAATAACGGAATTTAAGTT  
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## Appendix A

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## Appendix A

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## Appendix B

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## Appendix B

## NMB Open Reading Frames

NMB0001 acetyltransferase, putative 491 3  
NMB0002 hypothetical protein 890 498  
NMB0003 glutamyl-tRNA synthetase 2305 914  
NMB0004 EpiH/GdmH-related protein 3154 2513  
NMB0005 arsenate reductase 3504 3154  
NMB0006 thioredoxin-related protein 3628 4304  
NMB0007 cell division ATP-binding protein FtsE 4304 4951  
NMB0008 cell division protein FtsX, putative 4951 5865  
NMB0009 Bola/YrbA family protein 5959 6204  
NMB0010 phosphoglycerate kinase 7485 6277  
NMB0011 UDP-N-acetylglucosamine 1-carboxyvinyltransferase 8819 7569  
NMB0012 conserved hypothetical protein 10310 9342  
NMB0013 conserved hypothetical protein 10792 10346  
NMB0014 3-deoxy-D-manno-octulosonic-acid transferase 12104 10836  
NMB0015 6-phosphogluconate dehydrogenase, decarboxylating 13615 12170  
NMB0016 hypothetical protein 13911 14144  
NMB0017 UDP-3-O-3-hydroxymyristoyl N-acetylglucosamine deacetylase 16137  
15217  
NMB0018 pilin PilE 17734 17225  
NMB0019 pilS cassette 18932 18513  
NMB0020 pilS cassette 19646 19263  
NMB0021 pilS cassette 20297 19914  
NMB0022 pilS cassette 21157 20894  
NMB0023 pilS cassette 21882 21466  
NMB0024 pilS cassette 22474 22061  
NMB0025 large pilS cassette 23489 22821  
NMB0026 pilS cassette 23868 23594  
NMB0027 FKBP-type peptidyl-prolyl cis-trans isomerase 24226 23900  
NMB0028 hypothetical protein 24522 24307  
NMB0029 glycerate dehydrogenase 24644 25594  
NMB0030 methionyl-tRNA synthetase 27729 25675  
NMB0031 glucosamine--fructose-6-phosphate aminotransferase (isomerizing)  
29683 27848  
NMB0032 hypothetical protein 29959 30483  
NMB0033 membrane-bound lytic murein transglycosylase A, putative 32229  
30907  
NMB0034 conserved hypothetical protein 32440 33276  
NMB0035 conserved hypothetical protein 33276 34439  
NMB0036 conserved hypothetical protein 34706 35968  
NMB0037 phnA protein 36372 36046  
NMB0038 UDP-N-acetylglucosamine pyrophosphorylase 37817 36450  
NMB0039 hypothetical protein 38144 37875  
NMB0040 hydrolase, putative 38850 38140  
NMB0041 ABC transporter, periplasmic solute-binding protein 38909 39907  
NMB0042 conserved hypothetical protein 40004 40849  
NMB0043 conserved hypothetical protein 40878 41360  
NMB0044 peptide methionine sulfoxide reductase 43033 41468  
NMB0045 signal recognition particle protein 43179 44441  
NMB0046 hypothetical protein 44451 44672  
NMB0047 conserved hypothetical protein 45072 45353  
NMB0048 conserved hypothetical protein FRAMESHIFT 47969 48109  
NMB0049 pilC2 protein FRAMESHIFT 48116 51279  
NMB0050 conserved hypothetical protein 55173 53026  
NMB0051 twitching motility protein 56685 55462  
NMB0052 twitching motility protein PilT 57891 56851  
NMB0053 conserved hypothetical protein 58011 58694  
NMB0054 hypothetical protein 58697 59101  
NMB0055 pyrroline-5-carboxylate reductase 59153 59941

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NMB0056 DnaK suppressor protein 60091 60504  
NMB0057 hypothetical protein 66347 66700  
NMB0058 hypothetical protein 66731 66885  
NMB0059 dnaJ protein 66972 68090  
NMB0060 conserved hypothetical protein 68289 70304  
NMB0061 dTDP-6-deoxy-L-lyxo-4-hexulose reductase FRAMESHIFT 70923 69924  
NMB0062 glucose-1-phosphate thymidyltransferase 71828 70965  
NMB0063 dTDP-D-glucose 4,6-dehydratase 72958 71894  
NMB0064 UDP-glucose 4-epimerase 74093 73077  
NMB0065 hypothetical protein 74476 75399  
NMB0066 rRNA adenine N-6-methyltransferase 75687 76418  
NMB0067 polysialic acid capsule biosynthesis protein SiaD, truncation  
77283 76609  
NMB0068 polysialic acid capsule biosynthesis protein SiaC 78416 77370  
NMB0069 polysialic acid capsule biosynthesis protein SiaB 79103 78420  
NMB0070 polysialic acid capsule biosynthesis protein synX 80240 79110  
NMB0071 capsule polysaccharide export outer membrane protein CtrA 80375  
81547  
NMB0072 capsule polysaccharide export inner-membrane protein CtrB 81565  
82725  
NMB0073 capsule polysaccharide export inner-membrane protein CtrC 82728  
83522  
NMB0074 capsule polysaccharide export ATP-binding protein CtrD 83522 84169  
NMB0075 transcriptional accessory protein Tex, putative 84236 86506  
NMB0076 methyltransferase HphIm(C), FRAMESHIFT 86540 87539  
NMB0077 site-specific DNA methylase, truncation 87529 87876  
NMB0078 UDP-glucose 4-epimerase, truncation 87922 88575  
NMB0079 dTDP-D-glucose 4,6-dehydratase 88694 89758  
NMB0080 glucose-1-phosphate thymidyltransferase 89824 90687  
NMB0081 dTDP-4-keto-6-deoxy-D-glucose-3,6-epimerase 90729 91280  
NMB0082 capsule polysaccharide modification protein LipA 91308 93419  
NMB0083 capsule polysaccharide modification protein LipB 93559 94815  
NMB0084 conserved hypothetical protein FRAMESHIFT 95185 96587  
NMB0085 sodium/glutamate symporter 96808 98019  
NMB0086 hypothetical protein 98121 99134  
NMB0087 hypothetical protein 99148 99342  
NMB0088 outer membrane protein Pl, putative 101170 99773  
NMB0089 pyruvate kinase II 102957 101488  
NMB0090 IS1016 family transposase, putative FRAMESHIFT 103217 103857  
NMB0091 hypothetical protein 104399 104632  
NMB0092 hypothetical protein 104629 104853  
NMB0093 hypothetical protein 104856 104939  
NMB0094 hypothetical protein 105228 105413  
NMB0095 hypothetical protein 105423 105572  
NMB0096 hypothetical protein 105676 105843  
NMB0097 secretion protein, putative POINT MUTATION 105860 107344  
NMB0098 ABC transporter, ATP-binding protein FRAMESHIFT 107313 109396  
NMB0099 hypothetical protein 109624 109484  
NMB0100 hypothetical protein 109770 109627  
NMB0101 IS1016 family transposase, putative FRAMESHIFT 109850 110489  
NMB0102 hypothetical protein 110608 111123  
NMB0103 bacteriocin resistance protein, putative 111896 111405  
NMB0104 hypothetical protein 113073 112402  
NMB0105 PhnO-related protein 114197 113358  
NMB0106 aspartate carbamoyltransferase, catalytic subunit 114436 115353  
NMB0107 aspartate carbamoyltransferase, regulatory subunit 115366 115821  
NMB0108 hypothetical protein 115889 116551  
NMB0109 conserved hypothetical protein 117948 116620  
NMB0110 polypeptide deformylase 118018 118518  
NMB0111 methionyl-tRNA formyltransferase 118608 119531  
NMB0112 16S RNA methyltransferase 119613 120869  
NMB0113 hypothetical protein 120892 121431  
NMB0114 nitrogen regulation protein NtrY, putative 121434 123551  
NMB0115 nitrogen assimilation regulatory protein NtrX 123547 124821

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NMB0116 DNA processing chain A 124915 126105  
NMB0117 smg protein, putative 126134 126592  
NMB0118 DNA topoisomerase I 126667 128970  
NMB0119 hypothetical protein 129741 129049  
NMB0120 hypothetical protein 130312 129764  
NMB0121 conserved hypothetical protein 130431 130805  
NMB0122 conserved hypothetical protein 130897 131463  
NMB0123 ferredoxin, 4Fe-4S bacterial type 131589 131837  
NMB0124 translation elongation factor Tu 132257 133438  
NMB0125 preprotein translocase subunit SecE 133638 133913  
NMB0126 transcription antitermination protein NusG 133918 134451  
NMB0127 50S ribosomal protein L11 134555 134986  
NMB0128 50S ribosomal protein L1 134989 135681  
NMB0129 hypothetical protein 135753 135893  
NMB0130 50S ribosomal protein L10 135914 136411  
NMB0131 50S ribosomal protein L7/L12 136472 136840  
NMB0132 DNA-directed RNA polymerase, beta subunit FRAMESHIFT 137027 141208  
NMB0133 DNA-directed RNA polymerase, beta' subunit 141368 145540  
NMB0134 hypothetical protein 145835 146089  
NMB0135 conserved hypothetical protein 146089 146235  
NMB0136 30S ribosomal protein S12 146417 146785  
NMB0137 30S ribosomal protein S7 146906 147373  
NMB0138 elongation factor G (EF-G) 147395 149497  
NMB0139 translation elongation factor Tu 149586 150767  
NMB0140 30S ribosomal protein S10 150788 151096  
NMB0141 transposase, truncation 151241 151603  
NMB0142 50S ribosomal protein L3 151777 152418  
NMB0143 50S ribosomal protein L4 152421 153038  
NMB0144 50S ribosomal protein L23 153038 153349  
NMB0145 50S ribosomal protein L2 153358 154188  
NMB0146 30S ribosomal protein S19 154198 154473  
NMB0147 50S ribosomal protein L22 154485 154811  
NMB0148 30S ribosomal protein S3 154824 155513  
NMB0149 50S ribosomal protein L16 155500 155913  
NMB0150 50S ribosomal protein L29 155916 156104  
NMB0151 30S ribosomal protein S17 156107 156367  
NMB0152 50S ribosomal protein L14 156592 156957  
NMB0153 50S ribosomal protein L24 156972 157292  
NMB0154 50S ribosomal protein L5 157305 157841  
NMB0155 30S ribosomal protein S14 157847 158149  
NMB0156 30S ribosomal protein S8 158168 158557  
NMB0157 50S ribosomal protein L6 158574 159104  
NMB0158 50S ribosomal protein L18 159121 159471  
NMB0159 30S ribosomal protein S5 159493 160008  
NMB0160 50S ribosomal protein L30 160004 160186  
NMB0161 50S ribosomal protein L15 160191 160622  
NMB0162 preprotein translocase SecY subunit 160637 161944  
NMB0163 translation initiation factor IF-1 161952 162167  
NMB0164 50S ribosomal protein L36 162191 162301  
NMB0165 30S ribosomal protein S13 162370 162729  
NMB0166 30S ribosomal protein S11 162752 163144  
NMB0167 30S ribosomal protein S4 163167 163784  
NMB0168 DNA-directed RNA polymerase, alpha subunit 163813 164796  
NMB0169 50S ribosomal protein L17 164823 165188  
NMB0170 septum site-determining protein MinC 165338 166048  
NMB0171 septum site-determining protein MinD 166079 166891  
NMB0172 cell division topological specificity factor 166898 167158  
NMB0173 transcriptional regulator, LysR family 167165 168082  
NMB0174 valyl-tRNA synthetase 171252 168418  
NMB0175 conserved hypothetical protein 172158 171352  
NMB0176 D-amino acid dehydrogenase, small subunit 173595 172342  
NMB0177 sodium/alanine symporter, putative 175065 173677  
NMB0178 acyl-(acyl-carrier-protein)--UDP-N-acetylglucosamine O-acyltransferase 176198 175425



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NMB0179 (3R)-hydroxymyristoyl-(acyl carrier protein) dehydratase 176734  
176288  
NMB0180 UDP-3-O-(3-hydroxymyristoyl)-glucosamine N-acyltransferase 177814  
176771  
NMB0181 outer membrane protein OmpH, putative 178347 177850  
NMB0182 outer membrane protein Omp85 180806 178416  
NMB0183 conserved hypothetical protein 182203 180866  
NMB0184 1-deoxy-D-xylulose 5-phosphate reductoisomerase 183422 182241  
NMB0185 phosphatidate cytidyltransferase 184275 183481  
NMB0186 undecaprenyl pyrophosphate synthetase 185024 184281  
NMB0187 ribosome recycling factor 185637 185083  
NMB0188 conserved hypothetical protein 186944 185820  
NMB0189 hypothetical protein 187355 187774  
NMB0190 glucose inhibited division protein B 187935 188555  
NMB0191 ParA family protein 188657 189427  
NMB0192 ribonuclease HII 191274 190693  
NMB0193 glucose inhibited division protein A 193238 191346  
NMB0194 amino acid symporter, putative 194991 193567  
NMB0195 pyridoxal phosphate biosynthetic protein PdxA 195133 196137  
NMB0196 ribonuclease E 200197 197441  
NMB0197 hypothetical protein 200321 200605  
NMB0198 ribosomal large subunit pseudouridine synthase C 200690 201679  
NMB0199 lipid-A-disaccharide synthase 201730 202899  
NMB0200 hypothetical protein 203501 203115  
NMB0201 hypothetical protein 203724 204131  
NMB0202 hypothetical protein 204152 204322  
NMB0203 dihydrodipicolinate reductase 205207 204401  
NMB0204 lipoprotein, putative 205594 205220  
NMB0205 ferric uptake regulation protein 205813 206244  
NMB0206 leucyl/phenylalanyl-tRNA--protein transferase 206317 207039  
NMB0207 glyceraldehyde 3-phosphate dehydrogenase 208326 207298  
NMB0208 ferredoxin, 4Fe-4S bacterial type 209364 208528  
NMB0209 glutathione-regulated potassium-efflux system protein 209513  
211486  
NMB0210 site-specific DNA methylase, truncation 212082 212401  
NMB0211 L-serine dehydratase 214093 212711  
NMB0212 DNA gyrase subunit B 216580 214193  
NMB0213 hypothetical protein 216736 217719  
NMB0214 oligopeptidase A 217810 219843  
NMB0215 conserved hypothetical protein 221035 220472  
NMB0216 catalase 222945 221434  
NMB0217 RNA polymerase sigma-54 factor RpoN, putative 223293 224141  
NMB0218 glycosyltransferase 226194 225067  
NMB0219 3-oxoacyl-(acyl-carrier-protein) synthase II 227746 226502  
NMB0220 acyl carrier protein 228138 227905  
NMB0221 dihydroorotate dehydrogenase 228370 229374  
NMB0222 hypothetical protein 229540 230010  
NMB0223 hypothetical protein 230140 230355  
NMB0224 glutamate-ammonia-ligase adenylyltransferase 230556 233243  
NMB0225 transposase, IS30 family FRAMESHIFT 234513 233551  
NMB0226 conserved hypothetical protein 235470 234781  
NMB0227 conserved hypothetical protein 236771 235581  
NMB0228 conserved hypothetical protein 237637 236903  
NMB0229 conserved hypothetical protein FRAMESHIFT 238552 237662  
NMB0230 conserved hypothetical protein 239196 238552  
NMB0231 hypothetical protein 239356 239255 N  
NMB0232 DNA helicase II 239380 241584  
NMB0233 hypothetical protein 241663 241761  
NMB0234 hypothetical protein 242111 242647  
NMB0235 hypothetical protein 243052 242894  
NMB0236 hypothetical protein 243168 243063  
NMB0237 hypothetical protein 243535 243179  
NMB0238 IS1016 family transposase, degenerate 243588 243849  
NMB0239 hypothetical protein 244051 244668

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NMB0240 hypothetical protein 244694 246142  
NMB0241 NADH dehydrogenase I, A subunit 246607 246960  
NMB0242 NADH dehydrogenase I, B subunit 246954 247433  
NMB0243 NADH dehydrogenase I, C subunit 247449 248039  
NMB0244 NADH dehydrogenase I, D subunit 248032 249285  
NMB0245 NADH dehydrogenase I, E subunit 249288 249758  
NMB0246 NADH dehydrogenase I, F subunit 250151 251449  
NMB0247 hypothetical protein 251452 251886  
NMB0248 conserved hypothetical protein 252175 252411  
NMB0249 NADH dehydrogenase I, G subunit 252726 254984  
NMB0250 NADH dehydrogenase I, H subunit 254990 256063  
NMB0251 NADH dehydrogenase I, I subunit 256147 256623  
NMB0252 hypothetical protein 256657 257361  
NMB0253 NADH dehydrogenase I, J subunit 257400 258068  
NMB0254 NADH dehydrogenase I, K subunit 258068 258370  
NMB0255 cell filamentation protein Fic-related protein 258407 258979  
NMB0256 hypothetical protein 259106 259444  
NMB0257 NADH dehydrogenase I, L subunit 259496 261517  
NMB0258 NADH dehydrogenase I, M subunit 261616 263109  
NMB0259 NADH dehydrogenase I, N subunit 263122 264561  
NMB0260 hypothetical protein 264612 264995  
NMB0261 geranyltranstransferase 265863 265087  
NMB0262 exodeoxyribonuclease, small subunit 266188 265967  
NMB0263 conserved hypothetical protein 267358 266438  
NMB0264 ABC transporter, ATP-binding protein 269219 267366  
NMB0265 Holliday junction DNA helicase RuvA 269966 269385  
NMB0266 conserved hypothetical protein 270374 270051  
NMB0267 conserved hypothetical protein 271155 270439  
NMB0268 RNA methyltransferase, TrmH family 271749 271288  
NMB0269 competence protein 272539 271817  
NMB0270 bioH protein, putative 272538 273284  
NMB0271 hypothetical protein 273284 274069  
NMB0272 hypothetical protein 274527 274820  
NMB0273 hypothetical protein 274861 275283  
NMB0274 ATP-dependent DNA helicase RecQ 277728 275431  
NMB0275 indole-3-glycerol phosphate synthase 278575 277796  
NMB0276 conserved hypothetical protein 279582 278629  
NMB0277 virulence factor MviN 281255 279717  
NMB0278 thiol:disulfide interchange protein DsbA 281470 282165  
NMB0279 conserved hypothetical protein 283229 282228  
NMB0280 organic solvent tolerance protein, putative 283431 285704  
NMB0281 peptidyl-prolyl cis-trans isomerase 285809 286852  
NMB0282 ribonuclease II-related protein 290243 288366  
NMB0283 conserved hypothetical protein 290552 291181  
NMB0284 adenylosuccinate lyase 291256 292623  
NMB0285 O-antigen acetylase FRAMESHIFT 292707 294573  
NMB0286 conserved hypothetical protein 295481 294870  
NMB0287 probable ATP-dependent helicase DinG 297668 295521  
NMB0288 hypothetical protein 297740 297967  
NMB0289 deoxyribodipyrimidine photolyase, FRAMESHIFT 299363 298066  
NMB0290 transcriptional regulator, putative 300264 299356  
NMB0291 conserved hypothetical protein 300372 300767  
NMB0292 conserved hypothetical protein 300819 301421  
NMB0293 TonB-dependent receptor, putative 301610 303718  
NMB0294 thiol:disulfide interchange protein DsbA 303836 304528  
NMB0295 signal recognition particle protein 306232 304865  
NMB0296 CcsA-related protein 306452 307255  
NMB0297 hypothetical protein 307272 307367  
NMB0298 hypothetical protein 307401 307583  
NMB0299 comEA-related protein 313097 313540  
NMB0300 hypothetical protein 313603 313904  
NMB0301 Hypothetical protein 313958 314161  
NMB0302 IS1016C2 transposase, degenerate 314284 314933  
NMB0303 transposase, degenerate 315024 315307

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NMB0304 class 5 outer membrane protein, degenerate 315549 315295  
NMB0305 hypothetical protein 315891 315736  
NMB0306 hypothetical protein 316061 316252  
NMB0307 phospho-2-dehydro-3-deoxyheptonate aldolase, phe-sensitive 316403  
317455  
NMB0308 dihydrofolate reductase 317526 318011  
NMB0309 conserved hypothetical protein 318840 318367  
NMB0310 conserved hypothetical protein 319280 318855  
NMB0311 hypothetical protein 319392 319634  
NMB0312 virulence-associated protein VapA FRAMESHIFT 321089 323177  
NMB0313 conserved hypothetical protein 323422 324885  
NMB0314 hypothetical protein 326057 325092  
NMB0315 conserved hypothetical protein 326135 327424  
NMB0316 conserved hypothetical protein 328616 327933  
NMB0317 conserved hypothetical protein 329164 328694  
NMB0318 fatty acid efflux system protein 329606 330757  
NMB0319 fatty acid efflux system protein 330784 332307  
NMB0320 hypothetical protein 332373 332519  
NMB0321 50S ribosomal protein L28 332560 332790  
NMB0322 50S ribosomal protein L33 332825 332977  
NMB0323 UbiH family protein 334353 333172  
NMB0324 50S ribosomal protein L27 334964 334695  
NMB0325 50S ribosomal protein L21 335297 334992  
NMB0326 octaprenyl-diphosphate synthase 335521 336492  
NMB0327 conserved hypothetical protein FRAMESHIFT 336500 336944  
NMB0328 hypothetical protein 336993 337165  
NMB0329 type IV pilus assembly protein 337388 339061  
NMB0330 conserved hypothetical protein 339358 339152  
NMB0331 kinase, putative 339983 339354  
NMB0332 type IV prepilin peptidase 340845 339988  
NMB0333 pilus assembly protein PilG 342151 340922  
NMB0334 glucose-6-phosphate isomerase 342508 344148  
NMB0335 2,3,4,5-tetrahydropyridine-2-carboxylate N-succinyltransferase  
344361 345179  
NMB0336 enoyl-(acyl-carrier-protein) reductase 345337 346119  
NMB0337 branched-chain amino acid aminotransferase, putative 347364 346369  
NMB0338 hypothetical protein 347506 347985  
NMB0339 conserved hypothetical protein 347999 349165  
NMB0340 lactoylglutathione lyase FRAMESHIFT 349193 349605  
NMB0341 tspA protein 352407 349783  
NMB0342 intracellular septation protein A 352613 353140  
NMB0343 conserved hypothetical protein 353158 353433  
NMB0344 Bola/YrbA family protein 353436 353711  
NMB0345 cell-binding factor, putative 353763 354626  
NMB0346 hypothetical protein 354700 355455  
NMB0347 conserved hypothetical protein 355531 356019  
NMB0348 conserved hypothetical protein 356053 357060  
NMB0349 glutamyl-tRNA synthetase-related protein 358020 357136  
NMB0350 hypothetical protein 358760 358311  
NMB0351 transaldolase 359966 358914  
NMB0352 sugar isomerase, KpsF/GutQ family 360063 361034  
NMB0353 conserved hypothetical protein 361255 361788  
NMB0354 hypothetical protein 361788 362366  
NMB0355 conserved hypothetical protein 362350 362877  
NMB0356 ABC transporter, ATP-binding protein 362924 363685  
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364160  
NMB0358 shikimate 5-dehydrogenase 365670 364864  
NMB0359 glutamate--ammonia ligase 365970 367385  
NMB0360 AmpG-related protein 367544 368824  
NMB0361 conserved hypothetical protein 368824 369096  
NMB0362 hypothetical protein 369205 369282  
NMB0363 hypothetical protein 369610 369744  
NMB0364 FrpC operon protein 370088 370858

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NMB0365 iron-regulated protein FrpC, truncation 370878 371150  
NMB0366 hypothetical protein 372373 371243  
NMB0367 hypothetical protein 372823 372440  
NMB0368 hypothetical protein 373350 372895  
NMB0369 hypothetical protein 373720 373334  
NMB0370 hypothetical protein 374229 373855  
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NMB0372 hypothetical protein 375341 374667  
NMB0373 hypothetical protein 375915 375559  
NMB0374 MafB-related protein 377321 375921  
NMB0375 mafA protein 378266 377328  
NMB0376 hypothetical protein 378379 378266  
NMB0377 conserved hypothetical protein 379516 378389  
NMB0378 phosphate permease, putative 379807 381378  
NMB0379 oxygen-independent coproporphyrinogen III oxidase 383155 381737  
NMB0380 transcriptional regulator, Crp/Fnr family 383360 384091  
NMB0381 cys regulon transcriptional activator 385157 384210  
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NMB0386 phosphatidylglycerophosphatase A 388049 388531  
NMB0387 ABC transporter, ATP-binding protein 390270 388597  
NMB0388 sugar transporter, putative 390657 392009  
NMB0389 aldose 1-epimerase 392016 393023  
NMB0390 maltose phosphorylase 393260 395515  
NMB0391 beta-phosphoglucomutase 395531 396193  
NMB0392 L-aspartate oxidase 397882 396377  
NMB0393 multidrug resistance protein 398266 397934  
NMB0394 quinolinate synthetase A 399530 398421  
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NMB0396 nicotinate-nucleotide pyrophosphorylase 400888 401766  
NMB0397 hypothetical protein 401797 402081  
NMB0398 transcriptional regulator, ArsR family 402176 402454  
NMB0399 exodeoxyribonuclease III 402517 403284  
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NMB0404 conserved hypothetical protein 411699 412016  
NMB0405 competence protein ComM 412033 413526  
NMB0406 conserved hypothetical protein 413629 414495  
NMB0407 thiol:disulfide interchange protein DsbA 414501 415142  
NMB0408 bacitracin resistance protein 415178 415996  
NMB0409 conserved hypothetical protein 417783 416575  
NMB0410 conserved hypothetical protein 418062 418514  
NMB0411 conserved hypothetical protein 418514 419497  
NMB0412 cell division protein FtsL-related protein 419491 419757  
NMB0413 penicillin-binding protein 2 419821 421563  
NMB0414 UDP-N-acetylmuramoylalanyl-D-glutamate--2,6-diaminopimelate ligase  
421591 423066  
NMB0415 conserved hypothetical protein FRAMESHIFT 423092 424736  
NMB0416 UDP-N-acetylmuramoylalanyl-D-glutamyl-2,6-diaminopimelate--D-  
alanyl-D-alanyl ligase 424864 426228  
NMB0417 hypothetical protein 426234 426407  
NMB0418 phospho-N-acetylmuramoyl-pentapeptide-transferase 426657 427736  
NMB0419 conserved hypothetical protein 427865 428458  
NMB0420 UDP-N-acetylmuramoylalanine--D-glutamate ligase 428545 429879  
NMB0421 cell division protein FtsW 430062 431330  
NMB0422 UDP-N-acetylglucosamine--N-acetylmuramyl-(pentapeptide)  
pyrophosphoryl-undecaprenol N-acetylglucosamine transferase  
431337 432401  
NMB0423 UDP-N-acetylmuramate--alanine ligase 432559 433965  
NMB0424 D-alanine--D-alanine ligase 434081 434992

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NMB0425 cell division protein FtsQ 435006 435710  
NMB0426 cell division protein FtsA 435799 437040  
NMB0427 cell division protein FtsZ 437162 438337  
NMB0428 conserved hypothetical protein 438479 439786  
NMB0429 hypothetical protein 440162 440263  
NMB0430 carboxyphosphoenolpyruvate phosphonmutase, putative 440412  
441287  
NMB0431 methylcitrate synthase/citrate synthase 2 441376 442527  
NMB0432 conserved hypothetical protein 442683 443468  
NMB0433 aconitate hydratase 1 443549 446152  
NMB0434 conserved hypothetical protein 446958 448124  
NMB0435 acetate kinase 448541 449737  
NMB0436 conserved hypothetical protein 450078 450716  
NMB0437 conserved hypothetical protein 451289 450849  
NMB0438 hypothetical protein 451463 451828  
NMB0439 conserved hypothetical protein 451876 453027  
NMB0440 prephenate dehydrogenase, putative 453959 453090  
NMB0441 nitrilase 454044 454853  
NMB0442 opacity protein FRAMESHIFT 455681 454888  
NMB0443 transposase, IS30 family 456456 457418  
NMB0444 conserved hypothetical protein 457979 458830  
NMB0445 bicyclomycin resistance protein, putative 459352 460581  
NMB0446 chorismate mutase/prephenate dehydratase 460662 461747  
NMB0447 DNA repair protein RecO 461787 462575  
NMB0448 pyridoxal phosphate biosynthetic protein PdxJ 462602 463327  
NMB0449 hypothetical protein 463482 463703  
NMB0450 hypothetical protein 463968 464411  
NMB0451 hypothetical protein 464424 465188  
NMB0452 holo-(acyl-carrier protein) synthase 465391 465765  
NMB0453 mutT protein 465850 466656  
NMB0454 hypothetical protein 466652 467071  
NMB0455 conserved hypothetical protein 467123 468262  
NMB0456 N-acetylmuramoyl-L-alanine amidase 469573 468326  
NMB0457 conserved hypothetical protein 470031 469573  
NMB0458 glutamate racemase 470233 471042  
NMB0459 conserved hypothetical protein 473202 472096  
NMB0460 transferrin-binding protein 2 475573 477708  
NMB0461 transferrin-binding protein 1 477798 480542  
NMB0462 spermidine/putrescine ABC transporter, periplasmic  
spermidine/putrescine-binding protein 483195 481819  
NMB0463 30S ribosomal protein S20 483261 483521  
NMB0464 phospholipase A1, putative 483685 484830  
NMB0465 conserved hypothetical protein 484976 485674  
NMB0466 aspartyl-tRNA synthetase 485735 487540  
NMB0467 hypothetical protein 487694 487975  
NMB0468 biosynthetic arginine decarboxylase 488145 490034  
NMB0469 agmatinase 490136 491056  
NMB0470 C4-dicarboxylate transporter 491257 492720  
NMB0471 conserved hypothetical protein 494006 492933  
NMB0472 8-amino-7-oxononanoate synthase 494229 495368  
NMB0473 conserved hypothetical protein 495381 496025  
NMB0474 biotin synthesis protein BioC, putative 496016 496795  
NMB0475 hypothetical protein 497063 498451  
NMB0476 hypothetical protein 498457 499551  
NMB0477 conserved hypothetical protein 499566 500099  
NMB0478 hypothetical protein 500104 500745  
NMB0479 conserved hypothetical protein 500771 501127  
NMB0480 TspB-related protein 502193 501801  
NMB0481 hypothetical protein 502509 502180  
NMB0482 hypothetical protein 502900 502625  
NMB0483 Hypothetical protein 503191 502910  
NMB0484 hypothetical protein 503396 503202  
NMB0485 hypothetical protein 503691 503404  
NMB0486 conserved hypothetical protein FRAMESHIFT 505078 503739

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NMB0487 hypothetical protein 505244 505152  
NMB0488 hypothetical protein 505800 505309  
NMB0489 hypothetical protein 506682 505804  
NMB0490 PspA-related protein 507809 506910  
NMB0491 hypothetical protein 508744 508304  
NMB0492 hypothetical protein 509383 509063  
NMB0493 hemagglutinin/hemolysin-related protein 517494 509386  
NMB0494 DNA helicase, truncation 518107 517625  
NMB0495 replication protein 519187 518207  
NMB0496 hemolysin activator-related protein 519134 520810  
NMB0497 hemagglutinin/hemolysin-related protein 520922 526826  
NMB0498 hypothetical protein 526836 527342  
NMB0499 hypothetical protein 527471 529090  
NMB0500 hypothetical protein 529102 529476  
NMB0501 hypothetical protein 529757 530128  
NMB0502 hypothetical protein 530166 532115  
NMB0503 hypothetical protein 532134 532562  
NMB0504 hypothetical protein 532780 532992  
NMB0506 hypothetical protein 533691 535208  
NMB0507 hypothetical protein 535208 535693  
NMB0508 hypothetical protein 535883 536152  
NMB0509 hypothetical protein 536335 537114  
NMB0510 hypothetical protein 537136 537396  
NMB0511 hypothetical protein 537506 539425  
NMB0512 hypothetical protein 539437 539856  
NMB0513 hypothetical protein 539896 540294  
NMB0514 hypothetical protein 540420 540656  
NMB0515 hypothetical protein 540656 541036  
NMB0516 hypothetical protein 541042 541974  
NMB0517 hypothetical protein 542172 542020  
NMB0518 hypothetical protein 542486 542734  
NMB0519 hypothetical protein 542725 542925  
NMB0520 hypothetical protein 542931 543107  
NMB0521 hypothetical protein 543492 543947  
NMB0522 transposase, truncated 543958 544080  
NMB0523 ABC transporter, ATP-binding protein, truncation 544162 544441  
NMB0524 ribonuclease BN, putative 545691 544474  
NMB0525 aluminum resistance protein, putative 546236 546892  
NMB0526 hypothetical protein 546923 547438  
NMB0527 6-pyruvoyl tetrahydrobiopterin synthase, putative 547448 547867  
NMB0528 conserved hypothetical protein 548139 548507  
NMB0529 conserved hypothetical protein 548507 549142  
NMB0530 glycosyl hydrolase, family 3 550869 549787  
NMB0531 conserved hypothetical protein 552446 550929  
NMB0532 protease DO 554147 552651  
NMB0533 endonuclease III 554914 554288  
NMB0534 conserved hypothetical protein 555373 554963  
NMB0535 glucose/galactose transporter 555906 557183  
NMB0536 Na<sup>+</sup>/H<sup>+</sup> antiporter 557477 558853  
NMB0537 conserved hypothetical protein 559809 558988  
NMB0538 conserved hypothetical protein 560326 559820  
NMB0539 porphobilinogen deaminase 560445 561377  
NMB0540 aspartate aminotransferase 562977 561787  
NMB0541 hypothetical protein 563556 563062  
NMB0542 hypothetical protein 563672 563872  
NMB0543 L-lactate permease, putative 565630 564047  
NMB0544 conserved hypothetical protein 566621 565902  
NMB0545 conserved hypothetical protein 566870 570352  
NMB0546 alcohol dehydrogenase, propanol-preferring 571566 570523  
NMB0547 type IV pilin protein 572238 571852  
NMB0548 AcrA/AcrE family protein 572464 573639  
NMB0549 ABC transporter, ATP-binding protein 573708 575639  
NMB0550 thiol:disulfide interchange protein DsbC 576837 576058  
NMB0551 primosomal protein n' 576975 579161

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NMB0552 hypothetical protein 580284 579214  
NMB0553 transposase, putative, POINT MUTATION 581288 580335  
NMB0554 dnaK protein 584451 582526  
NMB0555 hypothetical protein 584931 584662  
NMB0556 repressor protein, putative 585119 585802  
NMB0557 conserved hypothetical protein 585937 586272  
NMB0558 hypothetical protein 586435 586896  
NMB0559 ubiquinone biosynthesis protein AarF 586934 588442  
NMB0560 serine acetyltransferase 589620 588805  
NMB0561 grpE protein 589804 590379  
NMB0562 conserved hypothetical protein 590874 590662  
NMB0563 thiamine biosynthesis lipoprotein ApbE 591955 590903  
NMB0564 Na(+)-translocating NADH-quinone reductase, subunit F 593325  
592111  
NMB0565 Na(+)-translocating NADH-quinone reductase, subunit E 593932  
593342  
NMB0566 Na(+)-translocating NADH-quinone reductase, subunit D 594562  
593939  
NMB0567 Na(+)-translocating NADH-quinone reductase, subunit C 595338  
594565  
NMB0568 Na(+)-translocating NADH-quinone reductase, subunit B 596563  
595334  
NMB0569 Na(+)-translocating NADH-quinone reductase, subunit A 597909  
596569  
NMB0570 hypothetical protein 599680 598262  
NMB0571 conserved hypothetical protein 600400 600044  
NMB0572 hypothetical protein 601002 600400  
NMB0573 transcriptional regulator, AsnC family 601612 601052  
NMB0574 glycine cleavage system T protein 602042 603139  
NMB0575 glycine cleavage system H protein 603304 603687  
NMB0576 glutamyl-tRNA reductase 603842 605086  
NMB0577 NosR-related protein 605365 605934  
NMB0578 copper ABC transporter, periplasmic copper-binding protein 605991  
607022  
NMB0579 copper ABC transporter, ATP-binding protein 607083 607700  
NMB0580 protein disulfide isomerase NosL, putative 607842 608333  
NMB0581 electron transfer flavoprotein-ubiquinone oxidoreductase 610085  
608427  
NMB0582 bacteriocin resistance protein, putative 610757 610218  
NMB0583 IS1016C2 transposase 612651 611986  
NMB0584 FrpC operon protein 613242 614054  
NMB0585 iron-regulated protein FrpA, putative 614074 617979  
NMB0586 adhesin, putative 619176 618265  
NMB0587 membrane protein 620128 619256  
NMB0588 ABC transporter, ATP-binding protein 620907 620155  
NMB0589 50s ribosomal protein L19 621563 621201  
NMB0590 tRNA (guanine-N1)-methyltransferase FRAMESHIFT 622329 621582  
NMB0591 16S rRNA processing protein RimM 622838 622332  
NMB0592 30S ribosomal protein S16 623099 622857  
NMB0593 conserved hypothetical protein 625570 623147  
NMB0594 sensor histidine kinase 627094 625691  
NMB0595 DNA-binding response regulator 627785 627111  
NMB0596 hypothetical protein 629789 627978  
NMB0597 hypothetical protein 630132 629782  
NMB0598 Maf/YceF/YhdE family protein 630749 630144  
NMB0599 conserved hypothetical protein 631572 630805  
NMB0600 hypothetical protein 632272 631589  
NMB0601 conserved hypothetical protein 632479 632279  
NMB0602 hitA protein 632849 632529  
NMB0603 phosphoribosyl-ATP cyclohydrolase 633244 632924  
NMB0604 alcohol dehydrogenase, zinc-containing 634449 633388  
NMB0605 histone deacetylase family protein 636107 635001  
NMB0606 conserved hypothetical protein 636235 636498  
NMB0607 protein-export membrane protein SecD 636710 638563

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NMB0608 protein-export membrane protein SecF 638570 639502  
NMB0609 30s ribosomal protein S15 639728 639994  
NMB0610 spermidine/putrescine ABC transporter, ATP-binding protein 640243  
641499  
NMB0611 spermidine/putrescine ABC transporter, permease protein 641518  
642480  
NMB0612 spermidine/putrescine ABC transporter, permease protein 642483  
643367  
NMB0613 hypothetical protein 643392 643496  
NMB0614 oxidoreductase, putative 643496 644788  
NMB0615 ammonium transporter AmtB, putative 646340 645039  
NMB0616 IS1016 family transposase, degenerate 647272 646871  
NMB0617 transcription termination factor Rho 648837 647581  
NMB0618 phosphoenolpyruvate synthase 651441 649060  
NMB0619 conserved hypothetical protein 651853 652671  
NMB0620 phosphoglycolate phosphatase 653575 652916  
NMB0621 conserved hypothetical protein 654440 653616  
NMB0622 outer membrane lipoprotein carrier protein 654867 655487  
NMB0623 spermidine/putrescine ABC transporter, periplasmic  
spermidine/putrescine-binding protein 655763 656899  
NMB0624 galactosyltransferase-related protein FRAMESHIFT 657035 658253  
NMB0625 conserved hypothetical protein 658297 658824  
NMB0626 peptide chain release factor 3 660797 659205  
NMB0627 phosphoribosyl-AMP cyclohydrolase 661299 660907  
NMB0628 hisF protein 662097 661333  
NMB0629 phosphoribosylformimino-5-aminoimidazole carboxamide ribotide  
isomerase 662847 662113  
NMB0630 amidotransferase HisH 663518 662883  
NMB0631 phosphate acetyltransferase Pta, putative 665151 663652  
NMB0632 iron(III) ABC transporter, ATP-binding protein 666394 665339  
NMB0633 iron(III) ABC transporter, permease protein 667932 666418  
NMB0634 iron(III) ABC transporter, periplasmic binding protein 668995  
668003  
NMB0635 transposase, IS30 family 670247 669285  
NMB0636 hypothetical protein 670794 670414  
NMB0637 argininosuccinate lyase 672228 670855  
NMB0638 UTP--glucose-1-phosphate uridylyltransferase 673116 672250  
NMB0639 conserved hypothetical protein 673743 673147  
NMB0640 hypothetical protein 673969 673739  
NMB0641 inorganic pyrophosphatase 674610 674080  
NMB0642 dATP pyrophosphohydrolase 675169 674714  
NMB0643 MafB-related protein 675614 677437  
NMB0644 hypothetical protein 677443 677904  
NMB0645 ribonuclease FRAMESHIFT 677948 678275  
NMB0646 ribonuclease inhibitor barstar 678290 678574  
NMB0647 hypothetical protein 679091 680326  
NMB0648 hypothetical protein 680357 680776  
NMB0649 hypothetical protein 680970 681191  
NMB0650 hypothetical protein 681167 681583  
NMB0651 hypothetical protein 681687 682073  
NMB0652 mafA protein 682199 683137  
NMB0653 MafB-related protein 683144 684409  
NMB0654 hypothetical protein 684415 684729  
NMB0655 hypothetical protein 684867 685571  
NMB0656 hypothetical protein 685600 685926  
NMB0657 hypothetical protein 686024 686224  
NMB0658 Hypothetical protein 686055 686312  
NMB0659 hypothetical protein 686346 686744  
NMB0660 hypothetical protein 686929 687315  
NMB0661 bis(5'-nucleosyl)-tetraphosphatase, symmetrical/Trk system  
potassium uptake protein TrkG FRAMESHIFT 689659 687362  
NMB0662 ribonuclease, putative 690126 689740  
NMB0663 outer membrane protein NsgA 690786 690265  
NMB0664 hypothetical protein 691151 690960



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NMB0665 oxygen-independent coprophorphyrinogen III oxidase family protein  
692546 691374  
NMB0666 DNA ligase 695128 692606  
NMB0667 hypothetical protein 696562 695279  
NMB0668 ampD protein 697352 696783  
NMB0669 conserved hypothetical protein 697436 698428  
NMB0670 thymidylate kinase 698491 699108  
NMB0671 malate oxidoreductase (NAD) 699333 700610  
NMB0672 tetraacyldisaccharide 4'-kinase 701160 702191  
NMB0673 hypothetical protein 702394 702978  
NMB0674 conserved hypothetical protein 703050 703229  
NMB0675 3-deoxy-D-manno-octulosonate cytidyltransferase 703229 703987  
NMB0676 hypothetical protein 704013 704411  
NMB0677 hypothetical protein 704610 704723  
NMB0678 tryptophan synthase, alpha subunit 705306 706088  
NMB0679 acetyl-CoA carboxylase, carboxyl transferase beta subunit 706129  
706998  
NMB0680 cryptic protein 707672 707064  
NMB0681 conserved hypothetical protein 707781 708002  
NMB0682 dihydroorotase 708368 709399  
NMB0683 N utilization substance protein B 710195 709773  
NMB0684 riboflavin synthase, beta subunit 710749 710276  
NMB0685 hypothetical protein 711120 710800  
NMB0686 ribonuclease III 711287 712003  
NMB0687 GTP-binding protein Era 712003 712974  
NMB0688 N-(5'-phosphoribosyl)anthranilate isomerase 715446 714823  
NMB0689 transcription elongation factor GreB 715996 715508  
NMB0690 amidophosphoribosyltransferase 717640 716099  
NMB0691 colicin V production protein, putative 718450 717956  
NMB0692 tpc protein 719441 718446  
NMB0693 folylpolyglutamate synthase/dihydrofolate synthase 720728 719457  
NMB0694 folI protein 721205 720762  
NMB0695 hypothetical protein 721569 721213  
NMB0696 amino acid ABC transporter, ATP-binding protein FRAMESHIFT 722369  
721645  
NMB0697 dimethyladenosine transferase 723321 722545  
NMB0698 hypothetical protein 723518 724204  
NMB0699 tryptophan synthase, beta subunit 724290 725489  
NMB0700 IgA-specific serine endopeptidase 731118 725674  
NMB0701 hypothetical protein 731531 731280  
NMB0702 competence protein ComA 732529 734601  
NMB0703 competence lipoprotein ComL 735635 734835  
NMB0704 ribosomal large subunit pseudouridine synthase D 735634 736755  
NMB0705 transporter 737858 736914  
NMB0706 conserved hypothetical protein 738418 739194  
NMB0707 rare lipoprotein B, putative 739249 739725  
NMB0708 DNA polymerase III, delta subunit 739730 740725  
NMB0709 Hypothetical protein 740849 741265  
NMB0710 Hypothetical protein 741293 741856  
NMB0711 conserved hypothetical protein FRAMESHIFT 742826 741946  
NMB0712 RNA polymerase sigma-32 factor 744182 743313  
NMB0713 apolipoprotein N-acyltransferase, putative 746012 744441  
NMB0714 conserved hypothetical protein FRAMESHIFT 746771 746019  
NMB0715 Hypothetical protein 746967 747284  
NMB0716 Hypothetical protein 747440 747727  
NMB0717 cytochrome, putative 748209 747796  
NMB0718 ferrochelatase 749572 748493  
NMB0719 queuine tRNA-ribosyltransferase 750697 749585  
NMB0720 threonyl-tRNA synthetase 751005 752915  
NMB0721 translation initiation factor 3 752990 753454  
NMB0722 50S ribosomal protein L35 753604 753798  
NMB0723 50S ribosomal protein L20 753814 754170  
NMB0724 phenylalanyl-tRNA synthetase, alpha chain 754519 755508  
NMB0725 modification methylase HgaI-1 755694 756749

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NMB0726 type II restriction enzyme HgaI 756755 758221  
NMB0727 N-6 adenine-specific DNA methylase 758221 758868  
NMB0728 phenylalanyl-tRNA synthetase, beta chain 758896 761256  
NMB0729 integration host factor, alpha subunit 761333 761632  
NMB0730 hypothetical protein 762257 762739  
NMB0731 hypothetical protein 763002 763226  
NMB0732 adenosylmethionine-8-amino-7-oxononanoate aminotransferase 763559  
764857  
NMB0733 dethiobiotin synthase 764857 765501  
NMB0734 hypothetical protein 765519 765992  
NMB0735 4-hydroxybenzoate octaprenyltransferase 766025 766912  
NMB0736 PTS system, nitrogen regulatory IIA protein 767100 767546  
NMB0737 HPr kinase/phosphatase, putative 767551 768510  
NMB0738 conserved hypothetical protein 768494 769345  
NMB0739 conserved hypothetical protein 769429 770943  
NMB0740 DNA repair protein RecN 771255 772925  
NMB0741 conserved hypothetical protein 775384 773948  
NMB0742 conserved hypothetical protein 775684 776040  
NMB0743 ubiquinone/menaquinone biosynthesis methyltransferase UbiE 776097  
776831  
NMB0744 hypothetical protein 777054 777530  
NMB0745 2-amino-4-hydroxy-6-hydroxymethylidihydropteridine-  
pyrophosphokinase 778153 777662  
NMB0746 conserved hypothetical protein 778537 778166  
NMB0747 conserved hypothetical protein 779157 778594  
NMB0748 host factor-I 779535 779245  
NMB0749 penicillin-binding protein 4 780602 779667  
NMB0750 bacterioferritin comigratory protein 780923 781360  
NMB0751 integrase/recombinase XerD 781415 782287  
NMB0752 bacterioferritin-associated ferredoxin, putative 782462 782659  
NMB0753 conserved hypothetical protein 782828 783058  
NMB0754 hypothetical protein 783066 783173  
NMB0755 hypothetical protein 783194 783334  
NMB0756 dTDP-L-rhamnose synthase, putative 784398 783481  
NMB0757 phosphoribosylaminoimidazole-succinocarboxamide synthase 784598  
785458  
NMB0758 polyribonucleotide nucleotidyltransferase 785695 787815  
NMB0759 conserved hypothetical protein 788619 787894  
NMB0760 diaminopimelate epimerase 789006 789854  
NMB0761 hypothetical protein 789940 790164  
NMB0762 hypothetical protein 790198 790653  
NMB0763 cysteine synthase 790653 791582  
NMB0764 conserved hypothetical protein 792048 792950  
NMB0765 signal peptidase I 794128 793112  
NMB0766 GTP-binding protein LepA 796064 794274  
NMB0767 5-methylthioadenosine nucleosidase/S-adenosylhomocysteine  
nucleosidase 796909 796211  
NMB0768 twitching motility protein PilT 797095 798204  
NMB0769 DNA polymerase III, delta prime subunit, putative 798241 799215  
NMB0770 type IV pilus assembly protein PilZ, putative 799222 799569  
NMB0771 conserved hypothetical protein 799577 800353  
NMB0772 conserved hypothetical protein 800382 800594  
NMB0773 conserved hypothetical protein 800698 801006  
NMB0774 uracil phosphoribosyltransferase 801115 801738  
NMB0775 hypothetical protein 801764 802081  
NMB0776 conserved hypothetical protein 802335 802751  
NMB0777 uroporphyrinogen-III synthase HemD, putative 802796 803533  
NMB0778 uroporphyrin-III C-methyltransferase HemX, putative 803611 804882  
NMB0779 hypothetical protein 804882 806102  
NMB0780 hypothetical protein 806138 806575  
NMB0781 uroporphyrinogen decarboxylase 806732 807793  
NMB0782 DNA repair protein RadA 807982 809358  
NMB0783 conserved hypothetical protein 810116 809640  
NMB0784 phage shock protein E precursor, putative 810717 810361

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NMB0785 exodeoxyribonuclease V 135 KD polypeptide 814370 810759  
NMB0786 conserved hypothetical protein 815358 814453  
NMB0787 amino acid ABC transporter, periplasmic amino acid-binding protein  
815643 816467  
NMB0788 amino acid ABC transporter, permease protein 816514 817173  
NMB0789 amino acid ABC transporter, ATP-binding protein 817186 817938  
NMB0790 phosphoglucomutase 819343 817964  
NMB0791 peptidyl-prolyl cis-trans isomerase 820019 819513  
NMB0792 transporter, NadC family 821553 820141  
NMB0793 hypothetical protein 821759 821553  
NMB0794 hypothetical protein 822146 821787  
NMB0795 peptidyl-tRNA hydrolase 822988 822413  
NMB0796 conserved hypothetical protein 823319 823044  
NMB0797 conserved hypothetical protein 823749 823315  
NMB0798 cell division protein FtsH 825932 823968  
NMB0799 cell division protein FtsJ 826616 825999  
NMB0800 conserved hypothetical protein 826726 827007  
NMB0801 delta-aminolevulinic acid dehydratase 827193 828191  
NMB0802 cystathionine gamma-synthase 829414 828260  
NMB0803 conserved hypothetical protein 829606 830376  
NMB0804 NAD(P)H nitroreductase, putative 830489 831151  
NMB0805 transposase, IS30 family 831295 832257  
NMB0806 conserved hypothetical protein 833050 832295  
NMB0807 conserved hypothetical protein 833965 833078  
NMB0808 hypothetical protein 834551 833988  
NMB0809 conserved hypothetical protein 835399 834605  
NMB0810 transcriptional regulator, TetR family 836104 835457  
NMB0811 UDP-N-acetylpyruvoylglucosamine reductase 837156 836119  
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NMB0813 hypothetical protein 838634 838819  
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NMB0815 adenylosuccinate synthetase 840163 841464  
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NMB0821 hypothetical protein 843962 844519  
NMB0822 heat shock protein HtpX 845866 844826  
NMB0823 adenylate kinase 845878 846522  
NMB0824 orotidine 5'-phosphate decarboxylase 847051 847788  
NMB0825 ADP-heptose synthase, putative 847846 848814  
NMB0826 C-5 cytosine-specific DNA methylase 848854 850086  
NMB0827 type II restriction enzyme-related protein FRAMESHIFT 850091  
851119  
NMB0828 ADP-L-glycero-D-mannoheptose-6-epimerase 851251 852252  
NMB0829 type I restriction enzyme EcoRI24II M protein 852329 853870  
NMB0830 conserved hypothetical protein 853870 854877  
NMB0831 type I restriction enzyme S protein, degenerate 855046 856216  
NMB0832 anticodon nuclease 856277 857416  
NMB0833 type I restriction enzyme-related protein 857416 857799  
NMB0834 transposase, IS30 family 858756 857794  
NMB0835 type I restriction enzyme EcoRI24II R protein, putative 858832  
861594  
NMB0836 ATP-dependent Clp protease, ATP-binding subunit ClpA 863945 861639  
NMB0837 conserved hypothetical protein 864249 863950  
NMB0838 cold-shock domain family protein 864492 864692  
NMB0839 pmbA protein 866323 864995  
NMB0840 conserved hypothetical protein 866446 866979  
NMB0841 hypothetical protein 867029 867742  
NMB0842 single-stranded-DNA-specific exonuclease RecJ 867814 869511  
NMB0843 polyA polymerase 869811 871169  
NMB0844 hypothetical protein 871345 871665  
NMB0845 PhoH-related protein 872732 871782

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NMB0846 LPS biosynthesis protein-related protein 873905 872874  
NMB0847 hypothetical protein 874235 874065  
NMB0848 hypothetical protein 874369 875070  
NMB0849 deoxycytidine triphosphate deaminase, putative 875703 875140  
NMB0850 hypothetical protein 876185 875772  
NMB0851 recombination associated protein RdgC 877146 876250  
NMB0852 essential GTPase 878634 877180  
NMB0853 conserved hypothetical protein 879413 878787  
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NMB0863 hypothetical protein 884410 884141  
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NMB0866 hypothetical protein 886357 885491  
NMB0867 YabO/YceC/SfhB family protein 886521 887441  
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NMB0869 hypothetical protein 889009 888221  
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NMB0875 ribose-phosphate pyrophosphokinase 895258 896238  
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NMB0877 penicillin-binding protein 898174 897008  
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NMB0880 sulfate ABC transporter, permease protein 901835 900978  
NMB0881 sulfate ABC transporter, permease protein 902923 902090  
NMB0882 hypothetical protein 903214 903543  
NMB0883 conserved hypothetical protein 903878 904384  
NMB0884 superoxide dismutase 905491 904907  
NMB0885 replicative DNA helicase 905655 907058  
NMB0886 fimbrial protein FimT 907370 908035  
NMB0887 type IV pilus assembly protein PilV, putative 908056 908667  
NMB0888 hypothetical protein 908667 909605  
NMB0889 hypothetical protein 909587 910177  
NMB0890 type IV pilin-related protein 910170 910655  
NMB0891 hypothetical protein 911708 911944  
NMB0892 AzlC-related protein 912795 912376  
NMB0893 deoxyuridine 5'-triphosphate nucleotidohydrolase 912995 913444  
NMB0894 aminotransferase, class I 913525 914709  
NMB0895 conserved hypothetical protein 914975 915751  
NMB0896 integrase, FRAMESHIFT 916283 917352  
NMB0897 hypothetical protein 917468 917845  
NMB0898 hypothetical protein 917894 918079  
NMB0899 hypothetical protein 918396 918749  
NMB0900 hypothetical protein 919621 920535  
NMB0901 D-lactate dehydrogenase-related protein 920880 920599  
NMB0902 hypothetical protein 921133 920945  
NMB0903 hypothetical protein 921429 921139  
NMB0904 hypothetical protein 921686 921429  
NMB0905 hypothetical protein 921936 921724  
NMB0906 hypothetical protein 922860 922009  
NMB0907 hypothetical protein 923244 922888  
NMB0908 hypothetical protein 923512 923315  
NMB0909 hypothetical protein 924280 923759

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NMB0910 transcriptional regulator 925000 924287  
NMB0911 transposase, IS30 family 926382 925420  
NMB0912 hypothetical protein 926526 927149  
NMB0913 pemK protein 927552 927208  
NMB0914 pemI protein 927790 927557  
NMB0915 hypothetical protein 928640 928152  
NMB0916 hypothetical protein 928799 928662  
NMB0917 death-on-curing protein 929446 929081  
NMB0918 hypothetical protein 929574 929446  
NMB0919 IS1106 transposase, putative 930929 929973  
NMB0920 isocitrate dehydrogenase 934317 932095  
NMB0921 hypothetical protein 934522 934325  
NMB0922 alpha-2,3-sialyltransferase 934750 935862  
NMB0923 cytochrome c 936488 936033  
NMB0924 oxidoreductase, short-chain dehydrogenase/reductase family 936607  
937425  
NMB0925 acyl CoA thioester hydrolase family protein 937925 937482  
NMB0926 opacity protein 940336 939513  
NMB0927 proline iminopeptidase 941840 942769  
NMB0928 hypothetical protein 944025 942832  
NMB0929 dihydrodipicolinate synthase 944909 944037  
NMB0930 xanthine/uracil permease family protein 945369 946757  
NMB0931 RNA methyltransferase, TrmH family 947574 946825  
NMB0932 conserved hypothetical protein 948129 947644  
NMB0933 cytidine and deoxycytidylate deaminase family protein 948580  
948137  
NMB0934 DNA transformation protein tfoX-related protein 948853 948625  
NMB0935 tRNA delta(2)-isopentenylpyrophosphate transferase 949798 948860  
NMB0936 hypothetical protein 951481 950180  
NMB0937 elongation factor P (EF-P) 951788 952345  
NMB0938 hypothetical protein 953235 952402  
NMB0939 conserved hypothetical protein 953933 953355  
NMB0940 homoserine O-acetyltransferase 955069 953933  
NMB0941 50S ribosomal protein L36 955756 955634  
NMB0942 50S ribosomal protein L31, putative 956031 955759  
NMB0943 5,10-methylenetetrahydrofolate reductase 956231 957106  
NMB0944 5-methyltetrahydropteroyltriglutamate-homocysteine  
methyltransferase 957247 959520  
NMB0945 hypothetical protein 959535 959696  
NMB0946 peroxiredoxin 2 family protein/glutaredoxin 959802 960536  
NMB0947 lipoamide dehydrogenase, putative 960788 962188  
NMB0948 succinate dehydrogenase, cytochrome b556 subunit 962470 962844  
NMB0949 succinate dehydrogenase, hydrophobic membrane anchor protein  
962841 963179  
NMB0950 succinate dehydrogenase, flavoprotein subunit 963185 964945  
NMB0951 succinate dehydrogenase, iron-sulfur protein 965068 965772  
NMB0952 conserved hypothetical protein 965779 966024  
NMB0953 hypothetical protein 966024 966104  
NMB0954 citrate synthase 966139 967419  
NMB0955 2-oxoglutarate dehydrogenase, E1 component 967627 970452  
NMB0956 2-oxoglutarate dehydrogenase, E2 component, dihydrolipoamide  
succinyltransferase 970555 971733  
NMB0957 2-oxoglutarate dehydrogenase, E3 component, lipoamide  
dehydrogenase 972101 973531  
NMB0958 hypothetical protein 973659 973943  
NMB0959 succinyl-CoA synthetase, beta subunit 974045 975208  
NMB0960 succinyl-CoA synthetase, alpha subunit 975222 976109  
NMB0961 funZ protein 978267 976675  
NMB0962 excinuclease ABC, subunit A 981150 978304  
NMB0963 phosphatidylserine decarboxylase precursor-related protein 981305  
982099  
NMB0964 TonB-dependent receptor 985503 983230  
NMB0965 hypothetical protein 985832 985564

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NMB0966 para-aminobenzoate synthase glutamine amidotransferase component  
II 985925 986512

NMB0967 anthranilate phosphoribosyltransferase 986579 987634

NMB0968 hypothetical protein 987644 987729

NMB0969 hypothetical protein 988030 987792

NMB0970 conserved hypothetical protein, FRAMESHIFT 988106 989527

NMB0971 hypothetical protein 989493 989780

NMB0972 hypothetical protein 989788 989982

NMB0973 hypothetical protein 989993 990274

NMB0974 hypothetical protein 990284 990559

NMB0975 hypothetical protein 990690 991004

NMB0976 TspB-related protein 990991 991383

NMB0977 modulator of drug activity B, putative 991676 992146

NMB0978 NAD(P) transhydrogenase, beta subunit 993742 992360

NMB0979 hypothetical protein 994205 993825

NMB0980 NAD(P) transhydrogenase, alpha subunit 995750 994212

NMB0981 phosphoserine phosphatase 996040 996870

NMB0982 chloride channel protein-related protein 997018 998157

NMB0983 phosphoribosylaminoimidazolecarboxamide formyltransferase/IMP  
cyclohydrolase 998324 999901

NMB0984 transposase, putative, degenerate 1000517 1001457

NMB0985 El6-related protein 1001522 1002016

NMB0986 hypothetical protein 1001997 1002425

NMB0987 N-acetylmuramoyl-L-alanine amidase, putative 1002736 1003278

NMB0988 hypothetical protein 1003278 1003478

NMB0989 hypothetical protein 1003484 1003645

NMB0990 hypothetical protein 1003859 1004260

NMB0991 IS1106 transposase 1005417 1004308

NMB0992 adhesin 1007326 1005554

NMB0993 rubredoxin 1009428 1009261

NMB0994 acyl-CoA dehydrogenase family protein 1011202 1010114

NMB0995 macrophage infectivity potentiator-related protein 1012020 1011340

NMB0996 hypothetical protein 1012411 1012043

NMB0997 D-lactate dehydrogenase 1014397 1012709

NMB0998 oxidoreductase, putative 1014921 1018751

NMB0999 NifR3/SMM1 family protein 1018935 1019933

NMB1000 IS1106 transposase, putative FRAMESHIFT 1020537 1021551

NMB1001 integrase protein, degenerate 1023183 1022614

NMB1002 hypothetical protein 1024370 1023498

NMB1003 hypothetical protein 1024711 1024418

NMB1004 hypothetical protein 1024962 1024720

NMB1005 hypothetical protein 1025179 1024958

NMB1006 hypothetical protein 1025360 1025184

NMB1007 transcriptional regulator 1025451 1025819

NMB1008 hypothetical protein 1025824 1026444

NMB1009 conserved hypothetical protein 1026440 1026631

NMB1010 hypothetical protein 1026658 1027218

NMB1011 hypothetical protein 1027252 1028196

NMB1012 hypothetical protein 1028284 1028784

NMB1013 hypothetical protein 1028801 1028971

NMB1014 conserved hypothetical protein 1029045 1029635

NMB1015 IS150 transposase, putative FRAMESHIFT 1029653 1030443

NMB1016 conserved hypothetical protein 1031794 1031192

NMB1017 sulfate ABC transporter, periplasmic sulfate-binding protein  
1033574 1032522

NMB1018 conserved hypothetical protein 1034162 1033683

NMB1019 phosphoribosylaminoimidazole carboxylase, ATPase subunit 1035345  
1034212

NMB1020 hypothetical protein 1035887 1035345

NMB1021 anthranilate synthase component I 1037359 1035887

NMB1022 transposase, IS30 family 1038444 1037482

NMB1023 conserved hypothetical protein 1039543 1038587

NMB1024 conserved hypothetical protein 1040502 1039639

NMB1025 conserved hypothetical protein 1040896 1040537

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NMB1026 conserved hypothetical protein 1040971 1041447  
NMB1027 dnaJ protein, truncation 1041473 1042192  
NMB1028 conserved hypothetical protein 1042197 1043069  
NMB1029 aspartate ammonia-lyase 1044541 1043147  
NMB1030 conserved hypothetical protein 1045565 1045005  
NMB1031 3-isopropylmalate dehydrogenase 1046798 1045731  
NMB1032 type II restriction enzyme NlaIV 1047563 1046835  
NMB1033 modification methylase NlaIV 1048850 1047582  
NMB1034 3-isopropylmalate dehydratase, small subunit 1049666 1049028  
NMB1035 hypothetical protein 1049982 1049731  
NMB1036 3-isopropylmalate dehydratase, large subunit 1051488 1050082  
NMB1037 glutamate--cysteine ligase 1051748 1053094  
NMB1038 DNA repair protein RadC 1053220 1053894  
NMB1039 conserved hypothetical protein 1053970 1054692  
NMB1040 hypothetical protein 1054848 1056125  
NMB1041 GTP-binding protein 1056133 1057308  
NMB1042 cation transport ATPase, E1-E2 family 1057308 1059776  
NMB1043 hypothetical protein 1059940 1060142  
NMB1044 ferredoxin--NADP reductase 1061316 1060543  
NMB1045 hypothetical protein 1062298 1061507  
NMB1046 threonine synthase 1063753 1062347  
NMB1047 hypothetical protein 1064197 1063829  
NMB1048 hypothetical protein 1065918 1064452  
NMB1049 transcriptional regulator, putative 1066174 1067085  
NMB1050 transposase, IS30 family 1068512 1067550  
NMB1051 ABC transporter, ATP-binding protein 1070544 1068637  
NMB1052 dedA protein 1071207 1070566  
NMB1053 class 5 outer membrane protein 1072189 1071374  
NMB1054 IS1106 transposase, degenerate 1073920 1072988  
NMB1055 serine hydroxymethyltransferase 1075474 1074227  
NMB1056 hypothetical protein 1075753 1075544  
NMB1057 gamma-glutamyltranspeptidase 1077776 1075959  
NMB1058 conserved hypothetical protein FRAMESHIFT 1078161 1077902  
NMB1059 conserved hypothetical protein 1078505 1078720  
NMB1060 fructose-1,6-bisphosphatase 1079840 1078869  
NMB1061 conserved hypothetical protein 1080931 1080089  
NMB1062 conserved hypothetical protein 1081610 1081011  
NMB1063 dihydroneopterin aldolase 1081666 1082019  
NMB1064 conserved hypothetical protein 1082056 1082589  
NMB1065 crcB protein 1083465 1083109  
NMB1066 hypothetical protein 1084174 1083497  
NMB1067 cell division protein FtsK 1084339 1087380  
NMB1068 gamma-glutamyl phosphate reductase 1088870 1087611  
NMB1069 glutamate 5-kinase 1089992 1088886  
NMB1070 2-isopropylmalate synthase 1090477 1092027  
NMB1071 conserved hypothetical protein 1092125 1092784  
NMB1072 prolipoprotein diacylglycerol transferase 1093721 1092873  
NMB1073 conserved hypothetical protein 1094922 1093795  
NMB1074 acetylglutamate kinase 1095092 1095985  
NMB1075 conserved hypothetical protein 1098302 1097637  
NMB1076 DnaA-related protein 1098967 1098302  
NMB1077 ABC transporter, ATP-binding protein, truncation 1099623 1099075  
NMB1078 transcriptional regulator, UmuD/LexA family 1100312 1099875  
NMB1079 hypothetical protein 1100580 1100425  
NMB1080 ner protein FRAMESHIFT 1100802 1101061  
NMB1081 bacteriophage transposase 1101126 1103108  
NMB1082 hypothetical protein 1103120 1103317  
NMB1083 bacteriophage DNA transposition protein B, putative 1103481  
1104650  
NMB1084 hypothetical protein 1104655 1105173  
NMB1085 N-acetylmuramoyl-L-alanine amidase, putative 1105319 1105861  
NMB1086 hypothetical protein 1106234 1106467  
NMB1087 hypothetical protein 1106758 1107060  
NMB1088 conserved hypothetical protein 1107278 1107111

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NMB1089 hypothetical protein 1107506 1107841  
NMB1090 hypothetical protein 1107856 1108119  
NMB1091 hypothetical protein 1108119 1108313  
NMB1092 hypothetical protein 1108319 1108822  
NMB1093 hypothetical protein 1109412 1108825  
NMB1094 hypothetical protein 1109497 1111044  
NMB1095 conserved hypothetical protein 1111047 1112612  
NMB1096 conserved hypothetical protein 1112602 1113894  
NMB1097 cryptic Mu-phage G protein, putative 1114007 1114419  
NMB1098 I protein, putative 1114653 1115711  
NMB1099 transposase, IS30 family 1116767 1115805  
NMB1100 hypothetical protein 1116795 1117274  
NMB1101 conserved hypothetical protein 1117277 1117696  
NMB1102 hypothetical protein 1117746 1118336  
NMB1103 hypothetical protein 1118336 1118530  
NMB1104 phage sheath protein 1118536 1119942  
NMB1105 hypothetical protein 1120010 1120384  
NMB1106 hypothetical protein 1120391 1120753  
NMB1107 hypothetical protein 1121610 1121011  
NMB1108 hypothetical protein 1121780 1123933  
NMB1109 phage virion protein, putative 1123936 1125264  
NMB1110 tail protein, 43 kDa 1125257 1126399  
NMB1111 baseplate assembly protein V, putative 1126399 1127064  
NMB1112 conserved hypothetical protein 1127168 1127512  
NMB1113 conserved hypothetical protein FRAMESHIFT 1127529 1128580  
NMB1114 conserved hypothetical protein 1128580 1129137  
NMB1115 tail fibre protein, putative 1129151 1131121  
NMB1116 hypothetical protein 1131560 1132084  
NMB1117 hypothetical protein 1132350 1132204  
NMB1118 conserved hypothetical protein 1132762 1132478  
NMB1119 conserved hypothetical protein 1132842 1133444  
NMB1120 hypothetical protein 1133426 1133719  
NMB1121 conserved hypothetical protein 1133719 1133925  
NMB1122 ABC transporter, ATP-binding protein FRAMESHIFT 1135181 1134041  
NMB1198 conserved hypothetical protein 1199352 1198465  
NMB1161 hypothetical protein 1167620 1167426  
NMB1162 hypothetical protein 1168307 1167663  
NMB1163 hypothetical protein 1168675 1168307  
NMB1164 hypothetical protein 1169353 1168685  
NMB1165 oxidoreductase, short chain dehydrogenase/reductase family 1170237  
1169521  
NMB1128 conserved hypothetical protein 1139597 1138287  
NMB1167 hypothetical protein 1171869 1171666  
NMB1168 phytoene synthase, putative 1172903 1172034  
NMB1131 chaperone protein HscA 1142897 1141038  
NMB1132 hypothetical protein 1143630 1142977  
NMB1171 conserved hypothetical protein / ankyrin-related protein 1176464  
1175706  
NMB1172 ferredoxin, 2Fe-2S type 1176860 1176522  
NMB1173 hypothetical protein 1177278 1177138  
NMB1136 hypothetical protein 1146017 1145337  
NMB1175 conserved hypothetical protein 1178247 1178053  
NMB1176 conserved hypothetical protein 1178719 1178321  
NMB1139 acetyl-CoA carboxylase, carboxyl transferase alpha subunit 1147851  
1146895  
NMB1140 mesJ protein FRAMESHIFT 1149229 1147948  
NMB1179 RNA methyltransferase, TrmH family 1182124 1181516  
NMB1180 hypothetical protein 1182411 1182178  
NMB1181 hypothetical protein 1182945 1182583  
NMB1182 hypothetical protein 1183262 1182960  
NMB1145 UDP-N-acetylmuramate:L-alanyl-gamma-D-glutamyl-meso-  
diaminopimelate ligase 1152664 1151291  
NMB1146 biotin synthetase 1153923 1152874  
NMB1185 hypothetical protein 1186675 1186043



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NMB1148 hypothetical protein 1154845 1154693  
NMB1187 hypothetical protein 1187052 1186912  
NMB1150 dihydroxy-acid dehydratase 1157144 1155288  
NMB1189 sulfite reductase hemoprotein, beta-component 1191122 1189356  
NMB1190 sulfite reductase (NADPH) flavoprotein, alpha component 1192963 1191152  
NMB1153 sulfate adenylyltransferase, subunit 1 1162210 1160927, plasmid protein  
NMB1192 sulfate adenylyltransferase, subunit 2 1195208 1194288  
NMB1155 phosphoadenosine phosphosulfate reductase 1163950 1163213  
NMB1194 siroheme synthase 1197448 1196000  
NMB1195 hypothetical protein 1197732 1197577  
NMB1158 nickel-dependent hydrogenase, b-type cytochrome subunit 1166365 1165712  
NMB1197 conserved hypothetical protein 1199352 1198465  
NMB1199 GTP-binding protein TypA 1201433 1199625  
NMB1200 ribonuclease II family protein 1202272 1204644  
NMB1201 IMP dehydrogenase 1206449 1204989  
NMB1202 hypothetical protein 1207237 1206779  
NMB1203 protein-PII uridylyltransferase 1209886 1207331  
NMB1204 transcriptional regulator 1210255 1209938  
NMB1205 hypothetical protein 1210426 1210283  
NMB1206 bacterioferritin B 1211053 1210583  
NMB1207 bacterioferritin A 1211545 1211084  
NMB1208 hypothetical protein 1211610 1211810  
NMB1209 hypothetical protein 1211900 1212100  
NMB1210 toxin-activating protein, putative 1212121 1212585  
NMB1211 hypothetical protein 1212984 1212745  
NMB1212 hypothetical protein 1213319 1212984  
NMB1213 hypothetical protein 1213678 1213319  
NMB1214 hemagglutinin/hemolysin-related protein 1220496 1213678  
NMB1215 hypothetical protein 1220814 1220659  
NMB1216 lipoic acid synthetase 1221989 1221009  
NMB1217 lipoate-protein ligase B 1222554 1221985  
NMB1218 conserved hypothetical protein 1222882 1222610  
NMB1219 transporter, putative 1223067 1224134  
NMB1220 stomatin/Mec-2 family protein 1225281 1224337  
NMB1221 hypothetical protein 1225703 1225299  
NMB1222 uracil-DNA glycosylase 1225784 1226440  
NMB1223 site-specific DNA methylase, degenerate 1226520 1229028  
NMB1224 hypothetical protein 1229552 1229154  
NMB1225 hypothetical protein 1230112 1229600  
NMB1226 ABC transporter, ATP-binding protein 1232500 1230581  
NMB1227 conserved hypothetical protein 1232972 1232580  
NMB1228 homoserine dehydrogenase 1233145 1234449  
NMB1229 hypothetical protein 1234445 1234876  
NMB1230 DNA-binding protein HU-beta 1235207 1234941  
NMB1231 ATP-dependent protease La 1237851 1235392  
NMB1232 conserved hypothetical protein 1238285 1239202  
NMB1233 exodeoxyribonuclease V, alpha subunit 1240978 1239236  
NMB1234 ABC transporter, ATP-binding protein 1241741 1241049  
NMB1235 conserved hypothetical protein 1242981 1241737  
NMB1236 hypothetical protein 1243186 1243461  
NMB1237 recombination protein RecR 1244140 1243523  
NMB1238 peptidyl-prolyl cis-trans isomerase-related protein 1245742 1244207  
NMB1239 conserved hypothetical protein 1246176 1245805  
NMB1240 ABC transporter, ATP-binding protein 1246326 1247951  
NMB1241 tRNA nucleotidyltransferase 1248026 1249276  
NMB1242 hypothetical protein 1249502 1249807  
NMB1243 Holliday junction DNA helicase RuvB 1249892 1250920  
NMB1244 ribulose-phosphate 3-epimerase 1251674 1250949  
NMB1245 hypothetical protein 1252367 1252035  
NMB1246 conserved hypothetical protein 1253294 1252434

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NMB1247 riboflavin synthase, alpha subunit 1254006 1253305  
NMB1248 molybdopterin-guanine dinucleotide biosynthesis protein A  
FRAMESHIFT 1254659 1254085  
NMB1249 nitrate/nitrite sensory protein NarX, putative 1254901 1256670  
NMB1250 transcriptional regulator, LuxR family 1256670 1257323  
NMB1251 transposase, IS30 family 1258731 1257769  
NMB1252 phosphoribosylformylglycinamide cyclo-ligase 1259914 1258883  
NMB1253 hypothetical protein 1260672 1261346  
NMB1254 GTP cyclohydrolase II 1261342 1261932  
NMB1255 glycosyl transferase, degenerate 1262256 1263263  
NMB1256 GTP cyclohydrolase II/3,4-dihydroxy-2-butanone-4-phosphate  
synthase 1263728 1264816  
NMB1257 site-specific DNA methylase, degenerate 1265357 1265130  
NMB1258 conserved hypothetical protein 1267046 1265739  
NMB1259 transposase, IS30 family 1267584 1268546  
NMB1260 type III restriction-modification system EcoPI enzyme, subunit res  
1271565 1268629  
NMB1261 type III restriction-modification system EcoPI enzyme, subunit mod  
POINT MUTATION FRAMESHIFT 1273661 1271581  
NMB1262 peptidyl-prolyl cis-trans isomerase 1274334 1273780  
NMB1263 CobW-related protein 1275316 1274402  
NMB1264 conserved hypothetical protein 1275771 1275502  
NMB1265 conserved hypothetical protein 1276061 1275771  
NMB1266 zinc uptake regulation protein, putative 1276582 1276109  
NMB1267 low molecular weight protein tyrosine-phosphatase 1277108 1276656  
NMB1268 conserved hypothetical protein 1278348 1277236  
NMB1269 hypothetical protein 1279559 1278465  
NMB1270 conserved hypothetical protein 1281272 1279644  
NMB1271 mercury transport periplasmic protein, putative 1281584 1281375  
NMB1272 hypothetical protein 1281765 1281625  
NMB1273 alginate O-acetylation protein AlgI, putative 1282215 1283648  
NMB1274 hypothetical protein 1283662 1284642  
NMB1275 hypothetical protein 1284642 1286083  
NMB1276 long-chain-fatty-acid--CoA ligase 1286122 1287672  
NMB1277 transporter, BCCT family 1289792 1287768  
NMB1278 site-specific recombinase 1290081 1292084  
NMB1279 membrane-bound lytic murein transglycosylase B, putative 1293319  
1292213  
NMB1280 very long chain acyl-CoA dehydrogenase-related protein 1294948  
1293524  
NMB1281 transcription-repair coupling factor 1295133 1299269  
NMB1282 aspartate 1-decarboxylase 1299421 1299801  
NMB1283 2-dehydro-3-deoxyphosphooctonate aldolase 1299826 1300665  
NMB1284 hypothetical protein 1300683 1301120  
NMB1285 enolase 1301171 1302454  
NMB1286 conserved hypothetical protein 1302471 1302746  
NMB1287 ferredoxin, putative 1303080 1302793  
NMB1288 ribonucleoside-diphosphate reductase, beta subunit 1304479 1303328  
NMB1289 type II restriction enzyme, putative 1305706 1304522  
NMB1290 C-5 cytosine-specific DNA-methylase 1306712 1305702  
NMB1291 ribonucleoside-diphosphate reductase, alpha subunit 1309049  
1306773  
NMB1292 hypothetical protein 1309394 1309209  
NMB1293 hypothetical protein 1309563 1309886  
NMB1294 1-acyl-sn-glycerol-3-phosphate acyltransferase 1310967 1310203  
NMB1295 formamidopyrimidine-DNA glycosylase 1311882 1311058  
NMB1296 hypothetical protein 1312599 1311937  
NMB1297 membrane-bound lytic murein transglycosylase D 1312778 1314751  
NMB1298 ribosomal small subunit pseudouridine synthase A 1314822 1315511  
NMB1299 sodium- and chloride-dependent transporter, degenerate 1316091  
1317454  
NMB1300 cytidylate kinase 1317701 1318354  
NMB1301 30S ribosomal protein S1 1318513 1320195  
NMB1302 integration host factor, beta subunit 1320209 1320520

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NMB1303 transcriptional regulator, MerR family 1321281 1320877  
NMB1304 alcohol dehydrogenase, class III 1321402 1322535  
NMB1305 esterase, putative 1322547 1323371  
NMB1306 conserved hypothetical protein 1323765 1324913  
NMB1307 nucleoside diphosphate kinase 1324975 1325397  
NMB1308 conserved hypothetical protein 1325543 1326634  
NMB1309 fimbrial biogenesis and twitching motility protein, putative  
1326640 1327398  
NMB1310 gcpE protein 1327417 1328679  
NMB1311 hypothetical protein 1328970 1328737  
NMB1312 ATP-dependent Clp protease, proteolytic subunit 1329655 1329128  
NMB1313 trigger factor 1331148 1329838  
NMB1314 cell division protein FtsK 1333791 1331356  
NMB1315 uracil permease 1334014 1335222  
NMB1316 hypothetical protein 1335289 1335726  
NMB1317 hypothetical protein 1335865 1336266  
NMB1318 CDP-diacylglycerol--serine O-phosphatidyltransferase 1336343  
1337086  
NMB1319 conserved hypothetical protein 1337090 1337860  
NMB1320 50S ribosomal protein L9 1338540 1338091  
NMB1321 30S ribosomal protein S18 1338787 1338560  
NMB1322 primosomal replication protein n, putative 1339096 1338797  
NMB1323 30S ribosomal protein S6 1339465 1339100  
NMB1324 thioredoxin reductase 1340571 1339624  
NMB1325 cation transport ATPase, E1-E2 family 1340710 1342869  
NMB1326 excinuclease ABC, subunit C 1342969 1344819  
NMB1327 conserved hypothetical protein 1345045 1346445  
NMB1328 conserved hypothetical protein 1346570 1347283  
NMB1329 hypothetical protein 1347649 1347840  
NMB1330 hypothetical protein 1348276 1347917  
NMB1331 excinuclease ABC, subunit B 1350416 1348392  
NMB1332 carboxy-terminal peptidase 1352229 1350748  
NMB1333 conserved hypothetical protein 1354146 1352359  
NMB1334 hypothetical protein 1354238 1354471  
NMB1335 creA protein 1354474 1355031  
NMB1336 conserved hypothetical protein 1355036 1355581  
NMB1337 conserved hypothetical protein 1355577 1356029  
NMB1338 isomerase, putative 1356698 1356045  
NMB1339 prolyl-tRNA synthetase 1358473 1356764  
NMB1340 hypothetical protein 1358924 1359151  
NMB1341 pyruvate dehydrogenase, E1 component 1359167 1361827  
NMB1342 pyruvate dehydrogenase, E2 component, dihydrolipoamide  
acetyltransferase FRAMESHIFT 1361979 1363583  
NMB1343 hypothetical protein 1363680 1364114  
NMB1344 pyruvate dehydrogenase, E3 component, lipoamide dehydrogenase  
1364135 1365916  
NMB1345 hypothetical protein 1367830 1366283  
NMB1346 TonB-dependent receptor, putative FRAMESHIFT 1369731 1367957  
NMB1347 extragenic suppressor protein SuhB 1370786 1370004  
NMB1348 RNA methylase, putative 1371030 1371842  
NMB1349 hypothetical protein 1371906 1372760  
NMB1350 hypothetical protein 1372967 1373305  
NMB1351 fmu and fmv protein, putative 1373656 1374909  
NMB1352 hypothetical protein 1375272 1375703  
NMB1353 aldehyde dehydrogenase family protein 1377097 1375757  
NMB1354 conserved hypothetical protein 1377755 1377105  
NMB1355 glutamyl-tRNA (Gln) amidotransferase subunit C, putative 1377906  
1378193  
NMB1356 Glu-tRNA(Gln) amidotransferase, subunit A 1378259 1379701  
NMB1357 conserved hypothetical protein 1379701 1380630  
NMB1358 Glu-tRNA(Gln) amidotransferase, subunit B 1380676 1382103  
NMB1359 CDP-6-deoxy-delta-3,4-glucose reductase, putative 1382318  
1383325  
NMB1360 pyridoxamine 5-phosphate oxidase 1384090 1383461

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NMB1361 conserved hypothetical protein 1384312 1385361  
NMB1362 oxalate/formate antiporter, putative 1386974 1385436  
NMB1363 exodeoxyribonuclease, large subunit 1388622 1387270  
NMB1364 NH(3)-dependent NAD<sup>+</sup> synthetase NadE, putative 1388819 1389637  
NMB1365 conserved hypothetical protein 1390183 1389713  
NMB1366 thioredoxin 1390481 1390810  
NMB1367 conserved hypothetical protein 1391930 1390869  
NMB1368 ATP-dependent RNA helicase, putative 1392141 1393526  
NMB1369 hypothetical protein 1394572 1394021  
NMB1370 hypothetical protein 1395217 1394860  
NMB1371 acetylornithine aminotransferase 1395561 1396754  
NMB1372 ATP-dependent Clp protease, ATP-binding subunit ClpX 1398104  
1396863  
NMB1373 ribosome-binding factor A 1398295 1398663  
NMB1374 tRNA pseudouridine synthase B 1398699 1399619  
NMB1375 modification methylase, putative FRAMESHIFT 1399839 1401945  
NMB1376 conserved hypothetical protein POINT MUTATION 1401938 1404712  
NMB1377 L-lactate dehydrogenase 1406036 1404867  
NMB1378 conserved hypothetical protein 1406327 1406770  
NMB1379 nifS protein 1406802 1408013  
NMB1380 nifU protein 1408280 1408663  
NMB1381 HesB/YadR/YfhF family protein 1408693 1409070  
NMB1382 conserved hypothetical protein 1409254 1409036  
NMB1383 chaperone protein HscB 1409336 1409833  
NMB1384 DNA gyrase subunit A 1409934 1412681  
NMB1385 IS1016 family transposase, degenerate 1412841 1413241  
NMB1386 transposase, putative FRAMESHIFT 1413303 1413955  
NMB1387 hypothetical protein 1414840 1414292  
NMB1388 glucose-6-phosphate isomerase 1416500 1414857  
NMB1389 RpiR/YebK/YfhH family protein 1417469 1416624  
NMB1390 glucokinase 1418505 1417522  
NMB1391 oxidoreductase, Sol/DevB family 1419181 1418489  
NMB1392 glucose-6-phosphate 1-dehydrogenase 1420906 1419464  
NMB1393 phosphogluconate dehydratase 1421474 1423306  
NMB1394 4-hydroxy-2-oxoglutarate aldolase/2-dehydro-3-deoxyphosphogluconate  
aldolase 1423490 1424125  
NMB1395 alcohol dehydrogenase, zinc-containing 1425427 1424390  
NMB1396 A/G-specific adenine glycosylase 1425581 1426627  
NMB1397 hypothetical protein 1426793 1426972  
NMB1398 Cu-Zn-superoxide dismutase 1427047 1427604  
NMB1399 IS1106 transposase 1429146 1428175  
NMB1400 ABC transporter family protein 1431631 1429406  
NMB1401 IS1016C2 transposase 1432983 1432447  
NMB1402 hypothetical protein 1433320 1433751  
NMB1403 FrpA/C-related protein 1433795 1433983  
NMB1404 hypothetical protein 1434021 1434746  
NMB1405 FrpA/C-related protein 1434763 1435962  
NMB1406 hypothetical protein 1436396 1436755  
NMB1407 FrpA-related protein, degenerate 1436755 1437881  
NMB1408 hypothetical protein 1437960 1438451  
NMB1409 FrpA/C-related protein 1438582 1439007  
NMB1410 hypothetical protein 1439247 1439783  
NMB1411 IS1016C2 transposase 1440610 1439960  
NMB1412 FrpC operon protein 1441216 1442022  
NMB1413 IS1016 family transposase, putative FRAMESHIFT 1442715 1442132  
NMB1414 FrpC operon protein 1442798 1443568  
NMB1415 iron-regulated protein FrpC 1443588 1449074  
NMB1416 aminopeptidase N 1452022 1449422  
NMB1417 conserved hypothetical protein 1452947 1452156  
NMB1418 HtrB/MsbB family protein 1454563 1453697  
NMB1419 crossover junction endodeoxyribonuclease RuvC 1455150 1454617  
NMB1420 factor-for-inversion stimulation protein Fis, putative 1455392  
1455156  
NMB1421 nifR3 protein 1456432 1455425

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NMB1422 ATP-dependent RNA helicase, putative 1456798 1458168  
NMB1423 conserved hypothetical protein 1458746 1459870  
NMB1424 hypothetical protein 1459903 1460928  
NMB1425 lysyl-tRNA synthetase, heat inducible 1462560 1461052  
NMB1426 hypothetical protein 1463968 1462718  
NMB1427 hypothetical protein 1464208 1464032  
NMB1428 aminopeptidase, putative 1464426 1466219  
NMB1429 outer membrane protein PorA 1468209 1467034  
NMB1430 transcription elongation factor GreA 1470964 1470491  
NMB1431 hypothetical protein 1471298 1471050  
NMB1432 3-phosphoshikimate 1-carboxyvinyltransferase 1471360 1472658  
NMB1433 conserved hypothetical protein FRAMESHIFT 1473237 1472707  
NMB1434 cardiolipin synthetase family protein 1474971 1473448  
NMB1435 drug resistance translocase family protein 1476489 1475086  
NMB1436 conserved hypothetical protein 1476774 1477550  
NMB1437 conserved hypothetical protein 1477550 1478248  
NMB1438 conserved hypothetical protein 1478248 1479699  
NMB1439 phosphoribosylaminoimidazole carboxylase, catalytic subunit  
1480370 1479888  
NMB1440 hypothetical protein 1481131 1480421  
NMB1441 O-methyltransferase, putative 1481799 1481134  
NMB1442 mismatch repair protein MutL 1482139 1484112  
NMB1443 DNA polymerase III, subunits gamma and tau 1484210 1486321  
NMB1444 conserved hypothetical protein 1486404 1486736  
NMB1445 recA protein 1489556 1488513  
NMB1446 3-dehydroquinate dehydratase 1489810 1490571  
NMB1447 ATP-dependent DNA helicase Rep 1490594 1492606  
NMB1448 DNA-damage-inducible protein P 1493734 1492781  
NMB1449 TonB-dependent receptor POINT MUTATION 1496967 1493881  
NMB1450 ferredoxin--NADP reductase 1497241 1498017  
NMB1451 DNA polymerase III, epsilon subunit 1499643 1498234  
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NMB1453 hypothetical protein 1502335 1501847  
NMB1454 ferredoxin, 4Fe-4S bacterial type 1503891 1502398  
NMB1455 hypothetical protein 1504075 1503959  
NMB1456 hypothetical protein 1504347 1504153  
NMB1457 transketolase 1504419 1506395  
NMB1458 fumarate hydratase, class II 1506547 1507932  
NMB1459 conserved hypothetical protein 1508923 1508003  
NMB1460 single-strand binding protein 1509972 1509451  
NMB1461 drug resistance translocase family protein 1511361 1509979  
NMB1462 transglycosylase, putative 1512092 1511472  
NMB1463 IS1106 transposase, degenerate 1512998 1512596  
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NMB1465 opacity protein FRAMESHIFT 1515309 1514483  
NMB1466 conserved hypothetical protein 1515639 1516367  
NMB1467 exopolyphosphatase 1516487 1517992  
NMB1468 hypothetical protein 1518527 1518207  
NMB1469 hypothetical protein 1518607 1518527  
NMB1470 hypothetical protein 1519392 1518850  
NMB1471 tryptophanyl-tRNA synthetase 1520471 1519464  
NMB1472 clpB protein 1520732 1523308  
NMB1473 aminotransferase, class I 1524612 1523401  
NMB1474 4-oxalocrotonate tautomerase, putative 1524910 1524704  
NMB1475 conserved hypothetical protein 1525255 1526058  
NMB1476 glutamate dehydrogenase, NAD-specific 1527384 1526122  
NMB1477 hypothetical protein 1527562 1527396  
NMB1478 phosphoglycolate phosphatase FRAMESHIFT 1527786 1528489  
NMB1479 regulatory protein RecX 1528560 1529018  
NMB1480 hypothetical protein 1529095 1529253  
NMB1481 hypothetical protein 1529262 1529393  
NMB1482 acyl CoA thioester hydrolase family protein 1529409 1529888  
NMB1483 lipoprotein NlpD, putative 1531499 1530255  
NMB1484 stationary-phase survival protein SurE 1532501 1531758

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NMB1485 conserved hypothetical protein 1534074 1532521  
NMB1486 hypothetical protein 1534263 1534126  
NMB1487 fimbrial assembly protein 1535230 1534445  
NMB1488 succinate-semialdehyde dehydrogenase (NADP+) 1536772 1535342  
NMB1489 hypothetical protein 1537259 1537750  
NMB1490 hypothetical protein 1538345 1537917  
NMB1491 hypothetical protein 1538785 1538699  
NMB1492 hypothetical protein 1538860 1538795  
NMB1493 carbon starvation protein A 1538892 1540970  
NMB1494 conserved hypothetical protein 1540963 1541154  
NMB1495 hypothetical protein 1541371 1541562  
NMB1496 conserved hypothetical protein 1541673 1542230  
NMB1497 TonB-dependent receptor 1543234 1545996  
NMB1498 aspartokinase, alpha and beta subunits 1549220 1548006  
NMB1499 ribonuclease PH 1550148 1549423  
NMB1500 conserved hypothetical protein 1550694 1550233  
NMB1501 HesA/MoeB/ThiF family protein 1550911 1551684  
NMB1502 hypothetical protein 1551825 1552349  
NMB1503 hypothetical protein 1552608 1552814  
NMB1504 conserved hypothetical protein 1552706 1553557  
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NMB1506 arginyl-tRNA synthetase 1554901 1556616  
NMB1507 hypothetical protein 1556714 1557070  
NMB1508 hypothetical protein 1557130 1558584  
NMB1509 amino acid ABC transporter, permease protein 1560344 1559601  
NMB1510 thermonuclease family protein 1561224 1560526  
NMB1511 ribose 5-phosphate isomerase A 1561934 1561266  
NMB1512 YgbB/YacN family protein 1562493 1562014  
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NMB1516 fixS protein 1565589 1565404  
NMB1517 hypothetical protein 1565885 1565589  
NMB1518 acetate kinase 1566236 1567429  
NMB1519 thiol:disulfide interchange protein DsbD 1569752 1567950  
NMB1520 hypothetical protein 1570337 1569819  
NMB1521 phytoene synthase-related protein 1571249 1570425  
NMB1522 FKBP-type peptidyl-prolyl cis-trans isomerase SlyD 1571803 1571324  
NMB1523 hypothetical protein 1572276 1572569  
NMB1524 oxidoreductase, putative 1572682 1574046  
NMB1525 VirG-related protein FRAMESHIFT 1576262 1574233  
NMB1526 small major protein B 1577081 1576638  
NMB1527 ADP-heptose--LPS heptosyltransferase II 1578146 1577139  
NMB1528 methylated-DNA--protein-cysteine methyltransferase, putative  
1579353 1578547  
NMB1529 conserved hypothetical protein FRAMESHIFT 1579597 1580409  
NMB1530 succinyl-diaminopimelate desuccinylase 1582228 1581086  
NMB1531 conserved hypothetical protein 1582961 1582344  
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NMB1533 H.8 outer membrane protein 1584150 1583602  
NMB1534 hypothetical protein 1584287 1584150  
NMB1535 hypothetical protein 1584404 1584874  
NMB1536 preprotein translocase SecA subunit 1584984 1587731  
NMB1537 DNA primase 1587879 1589648  
NMB1538 RNA polymerase sigma factor RpoD 1589838 1591763  
NMB1539 IS1106 transposase 1591913 1592917  
NMB1540 lactoferrin-binding protein A 1597271 1594443  
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NMB1546 hypothetical protein 1602795 1603076  
NMB1547 hypothetical protein 1603107 1603406

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NMB1548 tspB protein, putative 1603741 1605384  
NMB1549 hypothetical protein 1606176 1606325  
NMB1550 conserved hypothetical protein 1606332 1606613  
NMB1551 conserved hypothetical protein 1606617 1607717  
NMB1552 pilin gene inverting protein PivNM-1A 1608019 1608972  
NMB1553 transposase, truncation 1612022 1611708  
NMB1554 CTP synthase 1613884 1612253  
NMB1555 long-chain-fatty-acid--CoA ligase 1615666 1613999  
NMB1556 tRNA (5-methylaminomethyl-2-thiouridylate) -methyltransferase  
1616840 1615740  
NMB1557 conserved hypothetical protein 1617439 1616969  
NMB1558 diacylglycerol kinase 1618115 1617735  
NMB1559 glutathione synthetase 1619386 1618430  
NMB1560 glutamyl-tRNA synthetase 1621164 1619479  
NMB1561 transcriptional regulator, DeoR family 1622049 1621279  
NMB1562 conserved hypothetical protein 1622994 1622095  
NMB1563 transcriptional regulator, GntR family 1623859 1623146  
NMB1564 conserved hypothetical protein 1624850 1624431  
NMB1565 hypothetical protein 1625639 1624971  
NMB1566 phosphoribosylglycinamide formyltransferase 1626281 1625658  
NMB1567 macrophage infectivity potentiator 1627206 1626391  
NMB1568 DNA polymerase holoenzyme chi subunit, putative 1627905 1627468  
NMB1569 aminopeptidase A/I, FRAMESHIFT 1629499 1627971  
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NMB1571 conserved hypothetical protein 1630656 1631723  
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NMB1574 ketol-acid reductoisomerase 1636895 1635885  
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NMB1577 acetolactate synthase III, large subunit 1639564 1637840  
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NMB1584 3-hydroxyacid dehydrogenase 1646511 1647377  
NMB1585 transcriptional regulator, MarR family 1647658 1648086  
NMB1586 hypothetical protein 1648100 1648963  
NMB1587 protease, putative 1650120 1649020  
NMB1588 CDP-diacylglycerol--glycerol-3-phosphate 3-phosphatidyltransferase  
1651479 1650919  
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NMB1590 conserved hypothetical protein 1652675 1652343  
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NMB1592 hypothetical protein 1653729 1654313  
NMB1593 conserved hypothetical protein 1654445 1655305  
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spermidine/putrescine-binding protein 1656479 1655352  
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NMB1605 topoisomerase IV subunit A 1665137 1667437  
NMB1606 sensor histidine kinase 1667460 1669033  
NMB1607 sigma-54 dependent response regulator 1669029 1669493  
NMB1608 conserved hypothetical protein 1669600 1670349

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NMB1609 trans-sulfuration enzyme family protein 1672860 1671694  
NMB1610 hypothetical protein 1673766 1673008  
NMB1611 hypothetical protein 1673866 1674114  
NMB1612 amino acid ABC transporter, periplasmic amino acid-binding protein  
1674169 1674972  
NMB1613 fumarate hydratase, class I 1675282 1676802  
NMB1614 Trk system potassium uptake protein TrkA 1676903 1678312  
NMB1615 hypothetical protein 1678758 1679018  
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NMB1617 tellurite resistance protein, putative 1681480 1680614  
NMB1618 ribonuclease HI 1681594 1682028  
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NMB1623 major anaerobically induced outer membrane protein 1687918 1689087  
NMB1624 conserved hypothetical protein 1689215 1689967  
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NMB1627 conserved hypothetical protein 1693338 1693057  
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NMB1647 amino acid symporter, putative 1715420 1714005  
NMB1648 conserved hypothetical protein 1715747 1716472  
NMB1649 disulfide bond formation protein B 1717022 1716537  
NMB1650 leucine-responsive regulatory protein 1718177 1717716  
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NMB1659 guanosine-3',5'-bis(diphosphate) 3'-pyrophosphohydrolase 1734472  
1732319  
NMB1660 DNA-directed RNA polymerase, omega subunit 1734770 1734567  
NMB1661 guanylate kinase 1735446 1734832  
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NMB1666 hypothetical protein 1739498 1739253  
NMB1667 hypothetical protein 1740061 1739858  
NMB1668 hemoglobin receptor 1742596 1740224  
NMB1669 iron-starvation protein PigA 1743420 1742794  
NMB1670 PqiA family protein 1743706 1745214



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NMB1671 pqiB protein 1745210 1746868  
NMB1672 conserved hypothetical protein 1746871 1747386  
NMB1673 DNA-3-methyladenine glycosylase I, putative 1747393 1747941  
NMB1674 GDSL lipase family protein 1747934 1748572  
NMB1675 hypothetical protein 1748797 1749102  
NMB1676 glycine dehydrogenase (decarboxylating) 1749136 1751984  
NMB1677 cytochrome c5 1753288 1752452  
NMB1678 aromatic-amino-acid aminotransferase 1754906 1753716  
NMB1679 tRNA (uracil-5-)-methyltransferase 1756015 1754930  
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1767201  
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NMB1714 multidrug efflux pump channel protein 1791874 1790474  
NMB1715 multiple transferable resistance system protein MtrD 1795132  
1791932  
NMB1716 membrane fusion protein 1796382 1795147  
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NMB1719 efflux pump component MtrF 1798240 1799805  
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NMB1725 cytochrome c oxidase, subunit I 1808411 1806969  
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NMB1729 biopolymer transport protein ExbB 1812753 1812094  
NMB1730 TonB protein 1813661 1812822  
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NMB1732 transporter, putative 1815806 1815009

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NMB1733 hypothetical protein 1816445 1815945  
NMB1734 glutaredoxin 1817423 1816785  
NMB1735 GTP pyrophosphokinase 1817566 1819776  
NMB1736 transposase, putative FRAMESHIFT 1820048 1820856  
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NMB1738 secretion protein, putative 1823922 1822498  
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NMB1776 hypothetical protein 1860353 1860252  
NMB1777 hypothetical protein 1861364 1861122  
NMB1778 hypothetical protein 1861489 1861388  
NMB1779 hemagglutinin/hemolysin-related protein 1867499 1861515  
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NMB1782 hypothetical protein 1870236 1869937  
NMB1783 secretion protein, putative FRAMESHIFT 1871826 1870605  
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NMB1786 hypothetical protein 1873623 1872472  
NMB1787 N-acetyl-gamma-glutamyl-phosphate reductase 1874156 1875196  
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NMB1789 protein-export protein SecB 1878833 1878393  
NMB1790 glutaredoxin 3 1879111 1878857  
NMB1791 cytoplasmic axial filament protein FRAMESHIFT 1879236 1880813  
NMB1792 sensor histidine kinase 1881795 1880854  
NMB1793 response regulator, putative FRAMESHIFT 1882272 1881854  
NMB1794 citrate transporter 1883808 1882498  
NMB1795 hypothetical protein 1884071 1883916  
NMB1796 conserved hypothetical protein 1884950 1884381

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NMB1797 penicillin-binding protein 3 1885109 1886515  
NMB1798 IS1016 family transposase, putative FRAMESHIFT 1887236 1886597  
NMB1799 S-adenosylmethionine synthetase 1888654 1887488  
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NMB1801 HtrB/MsbB family protein 1889000 1889893  
NMB1802 O-sialoglycoprotein endopeptidase 1891004 1889943  
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NMB1804 cytochrome c-type biogenesis protein, putative 1894316 1892304  
NMB1805 cytochrome c4 1895153 1894533  
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NMB1807 penicillin-binding protein 1 1898505 1896112  
NMB1808 pilM protein 1898657 1899769  
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NMB1810 pilO protein 1900375 1901019  
NMB1811 pilP protein 1901040 1901582  
NMB1812 pilQ protein FRAMESHIFT 1901604 1903908  
NMB1813 shikimate kinase 1904813 1905322  
NMB1814 3-dehydroquinate synthase 1905405 1906481  
NMB1815 conserved hypothetical protein 1907451 1908290  
NMB1816 conserved hypothetical protein 1908323 1908784  
NMB1817 riboflavin-specific deaminase 1908819 1909925  
NMB1818 lipopolysaccharide biosynthesis protein, putative 1910123 1911541  
NMB1819 hypothetical protein 1911541 1911693  
NMB1820 pilin glycosylation protein PglB 1911712 1912950  
NMB1821 pilin glycosylation protein PglC 1913086 1914258  
NMB1822 pilin glycosylation protein PglD 1914309 1916216  
NMB1823 valine--pyruvate aminotransferase 1916275 1917564  
NMB1824 conserved hypothetical protein 1918455 1917622  
NMB1825 hypothetical protein 1919103 1918903  
NMB1826 conserved hypothetical protein 1919452 1919084  
NMB1827 DNA polymerase III, alpha subunit 1919852 1923283  
NMB1828 conserved hypothetical protein 1924652 1923723  
NMB1829 TonB-dependent receptor 1926848 1924725  
NMB1830 phosphoglycolate phosphatase, putative 1926996 1927652  
NMB1831 lytB protein 1928711 1927746  
NMB1832 lipoprotein signal peptidase 1929267 1928743  
NMB1833 isoleucyl-tRNA synthetase 1933332 1930546  
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NMB1836 lipopolysaccharide biosynthesis protein WbpC, putative 1938151  
1936283  
NMB1837 hypothetical protein 1938466 1938215  
NMB1838 GTP-binding protein, putative 1939615 1938527  
NMB1839 formate--tetrahydrofolate ligase 1941406 1939733  
NMB1840 conserved hypothetical protein 1941581 1942009  
NMB1841 mannose-1-phosphate guanylyltransferase-related protein 1942741  
1942049  
NMB1842 4-hydroxyphenylacetate 3-hydroxylase, small subunit, putative  
1943257 1942760  
NMB1843 transcriptional regulator, MarR family 1943812 1943375  
NMB1844 hypothetical protein 1943938 1943819  
NMB1845 thioredoxin 1944662 1944156  
NMB1846 Mrp/NBP35 family protein 1945032 1946108  
NMB1847 pilCl protein FRAMESHIFT 1947287 1950374  
NMB1848 hypothetical protein 1952279 1951938  
NMB1849 carbamoyl-phosphate synthase, small subunit 1952589 1953719  
NMB1850 hypothetical protein 1954091 1954363  
NMB1851 hypothetical protein 1954440 1954697  
NMB1852 conserved hypothetical protein 1954697 1955083  
NMB1853 hypothetical protein 1955422 1955691  
NMB1854 hypothetical protein 1955768 1956406  
NMB1855 carbamoyl-phosphate synthase, large subunit 1956438 1959650  
NMB1856 transcriptional regulator, LysR family 1960777 1959881  
NMB1857 modulator of drug activity B 1961016 1961591

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NMB1858 hypothetical protein 1961977 1961594  
NMB1859 S-adenosylmethionine:tRNA ribosyltransferase-isomerase 1963108  
1962071  
NMB1860 acetyl-CoA carboxylase, biotin carboxyl carrier protein 1963464  
1963916  
NMB1861 acetyl-CoA carboxylase, biotin carboxylase 1964031 1965389  
NMB1862 ribosomal protein L11 methyltransferase 1965653 1966537  
NMB1863 oligoribonuclease 1966558 1967118  
NMB1864 glutamate-1-semialdehyde 2,1-aminomutase 1968808 1967528  
NMB1865 hypothetical protein 1968821 1969036  
NMB1866 conserved hypothetical protein 1969593 1970918  
NMB1867 1-deoxyxylulose-5-phosphate synthase 1972919 1971009  
NMB1868 integrase/recombinase XerC 1973909 1973007  
NMB1869 fructose-bisphosphate aldolase 1974093 1975154  
NMB1870 hypothetical protein 1975177 1976136  
NMB1871 conserved hypothetical protein 1976286 1976960  
NMB1872 ribosomal-protein-alanine acetyltransferase, putative 1976960  
1977397  
NMB1873 DNA polymerase, bacteriophage-type, putative 1977394 1978128  
NMB1874 orotate phosphoribosyltransferase 1978193 1978831  
NMB1875 hypothetical protein 1978908 1979339  
NMB1876 N-acetylglutamate synthase 1979339 1980646  
NMB1877 prolyl oligopeptidase family protein 1980850 1982862  
NMB1878 transcriptional regulator, AraC family 1983567 1982983  
NMB1879 hypothetical protein 1983936 1983628  
NMB1880 ABC transporter, periplasmic solute-binding protein, putative  
1984172 1985134  
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NMB1882 TonB-dependent receptor 1986131 1988305  
NMB1883 hypothetical protein 1988727 1988440  
NMB1884 conserved hypothetical protein 1989047 1988727  
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NMB1898 lipoprotein 1998808 1999320  
NMB1899 hypothetical protein 1999330 1999770  
NMB1900 polyphosphate kinase 1999849 2001996  
NMB1901 IS1016C2 transposase, degenerate 2002232 2002770  
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NMB1903 chromosomal replication initiator protein DnaA 2005904 2004351  
NMB1904 ribosomal protein L34 2006196 2006327  
NMB1905 ribonuclease P protein component 2006333 2006695  
NMB1906 conserved hypothetical protein 2006763 2006981  
NMB1907 60 kd inner-membrane protein 2007156 2008790  
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NMB1909 Maf/YceF/YhdE family protein 2010236 2009649  
NMB1910 conserved hypothetical protein 2010384 2010884  
NMB1911 50S ribosomal protein L32 2010921 2011097  
NMB1912 conserved hypothetical protein 2011275 2011799  
NMB1913 fatty acid/phospholipid synthesis protein 2011891 2012943  
NMB1914 hypothetical protein 2013082 2013330  
NMB1915 hypothetical protein 2013360 2013746  
NMB1916 3-oxoacyl-(acyl-carrier-protein) synthase III 2013931 2014890  
NMB1917 conserved hypothetical protein 2014940 2015344

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NMB1918 malonyl CoA-acyl carrier protein transacylase 2015441 2016364  
NMB1919 ABC transporter, ATP-binding protein 2016505 2018367  
NMB1920 GMP synthase 2018470 2020032  
NMB1921 3-oxoacyl-(acyl-carrier-protein) reductase 2020097 2020840  
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NMB1926 lacto-N-neotetraose biosynthesis glycosyl transferase LgtE 2025680  
2024841  
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2025832  
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NMB1939 ATP synthase F0, C subunit 2037284 2037051  
NMB1940 ATP synthase F0, A subunit 2038207 2037344  
NMB1941 hypothetical protein 2038550 2038200  
NMB1942 hypothetical protein 2038997 2038707  
NMB1943 hypothetical protein 2039340 2039170  
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NMB1947 ABC transporter, permease protein 2042749 2042066  
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NMB1953 stringent starvation protein A 2048215 2047613  
NMB1954 hypothetical protein 2050146 2048488  
NMB1955 cadmium resistance protein 2050933 2050310  
NMB1956 50S ribosomal protein L31 2051451 2051239  
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NMB1963 conserved hypothetical protein 2055380 2054793  
NMB1964 conserved hypothetical protein 2055911 2055420  
NMB1965 conserved hypothetical protein 2056738 2055965  
NMB1966 ABC transporter, ATP-binding protein 2057586 2056789  
NMB1967 transcriptional regulator, AraC family 2057759 2058673  
NMB1968 aldehyde dehydrogenase A 2058936 2060375  
NMB1969 serotype-1-specific antigen, putative 2061412 2064657  
NMB1970 para-aminobenzoate synthetase component I/4-amino-4-  
deoxychorismate lyase, putative 2065692 2067470  
NMB1971 conserved hypothetical protein 2069049 2067535  
NMB1972 chaperonin, 60 kDa 2071379 2069748  
NMB1973 chaperonin, 10 kDa 2071762 2071475  
NMB1974 IS1016C2 transposase, degenerate 2071990 2072639  
NMB1975 sodium- and chloride-dependent transporter 2072855 2074387  
NMB1976 diaminopimelate decarboxylase 2075759 2074518

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NMB1977 hypothetical protein 2075940 2075773  
NMB1978 cyaY protein 2076011 2076331  
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NMB1988 iron-regulated outer membrane protein FrpB 2092611 2094752  
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2096434  
NMB1990 iron(III) ABC transporter, permease protein 2096601 2097566  
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NMB1993 iron(III) ABC transporter, ATP-binding protein 2099286 2100041  
NMB1994 adhesin/invasin, putative 2100342 2101433  
NMB1995 nitrogen regulatory protein P-II, FRAMESHIFT 2101839 2101423  
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NMB1997 hydroxyacylglutathione hydrolase 2106047 2106802  
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NMB2017 ComEA-related protein 2132027 2131584  
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NMB2028 thermoresistant gluconokinase 2145790 2146305  
NMB2029 homoserine kinase FRAMESHIFT 2147564 2146650  
NMB2030 3-demethylubiquinone-9 3-methyltransferase 2148329 2147604  
NMB2031 tryptophan transporter 2148481 2149719  
NMB2032 lipopolysaccharide glycosyl transferase, FRAMESHIFT 2149872  
2150922  
NMB2033 histidinol-phosphatase, putative 2151173 2151733  
NMB2034 1-acyl-sn-glycerol-3-phosphate acyltransferase, putative 2151765  
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NMB2036 tRNA pseudouridine synthase A 2154495 2155390  
NMB2037 hypothetical protein 2155415 2155651  
NMB2038 PemK-related protein 2155642 2155962  
NMB2039 major outer membrane protein PIB 2157487 2158479  
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NMB2060 glycerol-3-phosphate dehydrogenase (NAD+) 2181465 2180479  
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NMB2094 hypothetical protein 2214043 2214339  
NMB2095 adhesin complex protein, putative 2214580 2214951

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NMB2096 malate:quinone oxidoreductase 2216608 2215145  
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NMB2098 conserved hypothetical protein 2217735 2217148  
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NMB2157 pyrazinamidase/nicotinamidase PncA, putative 2267107 2266475  
NMB2158 conserved hypothetical protein 2267221 2267898  
NMB2159 glyceraldehyde 3-phosphate dehydrogenase 2269163 2268162



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NMB2160 DNA mismatch repair protein MutS 2269607 2272198  
NMB0505 hypothetical protein 533467 533186  
NMB1123 hypothetical protein 1135584 1135390  
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1143670  
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NMB1138 conserved hypothetical protein 1146683 1146285  
NMB1141 RNA methyltransferase, TrmH family 1150088 1149480  
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NMB1144 hypothetical protein 1151226 1150924, lipoprotein  
NMB1147 hypothetical protein 1154639 1154007, homology to plasmid proteins  
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NMB1196 nickel-dependent hydrogenase, b-type cytochrome subunit 1198401  
1197748

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/05928

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12Q1/68 C12N15/11 C07K14/22

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12Q C12N C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, CHEM ABS Data, MEDLINE, EMBASE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 17805 A (RAYMOND NIGEL ;QUINN FREDERICK D (US); US HEALTH (US); RIBOT EFRAI) 30 April 1998 (1998-04-30) the whole document	1-4, 7-14, 18-24
X	EP 0 467 714 A (MERCK & CO INC) 22 January 1992 (1992-01-22)  claims; example 3  --- -/--	1-4, 7-14, 18-24



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Date of the actual completion of the international search

10 October 2000

Date of mailing of the international search report

19.10.00

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International Application No

PCT/US 00/05928

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FLEISCHMANN R D ET AL: "WHOLE-GENOME RANDOM SEQUENCING AND ASSEMBLY OF HAEMOPHILUS INFLUENZAE RD" SCIENCE,US,AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE,, vol. 269, no. 5223, 28 July 1995 (1995-07-28), pages 496-498,507-51, XP000517090 ISSN: 0036-8075 the whole document	1-4, 7-14, 16-24
T	TETTELIN H ET AL: "Complete genome sequence of Neisseria meningitidis serogroup B strain MC58 'see comments!.' SCIENCE, (2000 MAR 10) 287 (5459) 1809-15., XP000914963 page 963	
T	PIZZA M ET AL: "Identification of vaccine candidates against serogroup B meningococcus by whole- genome sequencing 'see comments!.' SCIENCE, (2000 MAR 10) 287 (5459) 1816-20., XP000914964 the whole document	
T	PARKHILL J ET AL: "Complete DNA sequence of a serogroup A strain of Neisseria meningitidis Z2491 'see comments!.' NATURE, (2000 MAR 30) 404 (6777) 502-6., XP000918875 the whole document	

## INTERNATIONAL SEARCH REPORT

national application No.  
PCT/US 00/05928**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 16,17 (partly)  
because they relate to subject matter not required to be searched by this Authority, namely:  
Rule 39.1(v) PCT - Presentation of information (insofar as related to computer databases)
2. ☒ Claims Nos.: 5,6,15 (completely), 1-4, 7-14, 16-24 (partly)  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

## Continuation of Box I.2

Claims Nos.: 5,6,15 (completely), 1-4, 7-14, 16-24 (partly)

1) Claims 5 and 6 (and thus 15 which refers to claim 6 and whose reference to claims 7 and 8 is wrong) lack any essential technical feature which could allow a meaningful search to be carried out. They have thus not been searched. For the same reason claims 18-24 have not been searched insofar as referring to any of claims 5, 6 and 15.

2) Claims 1-4, 7-14, 16-24 have only been searched insofar as related to the full sequence SEQ ID 1 in view of the absence of any indication in the claims as to searcheable SEQ IDs corresponding to the "NMB open reading frames". SEQ ID 1 as such is not searchable by means of similarity algorithms since it is too long: the search with respect thereto has thus been carried out based on keywords.

3) A further reason for not searching claims 1-4 insofar as related to "NMB open reading frames" is that claim 1 is unclear (Art. 6 PCT). It relates to a method for searching open reading frames "within one or more...NMB open reading frames", which is however technically meaningless.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/05928

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